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Patterns for Steam Cylinders.

BY F. W. BARROWS.

It would not be possible for me to give a detailed account of all the different ways of making cylinder patterns and core boxes. In these days of almost universal use of steam engines, there are so many different makes that it would be quite a task to simply name them all, without going into particulars.

The larger part of slide valve engines have the same general form of cylinder, with the steam chest on one side; some are steam-jacketed, and a good many have the front cylinder-head cast as a part of the bed-piece.

In Figs. 42 and 43 I have shown a cylinder of the plain slide-valve type, and having a steam jacket with the steam-chest at one side, and to be fastened to the bed-piece at one end. If it is a cylinder of any size, make the body of staves, following the directions given in my last paper on stavework. I should prefer to leave the pattern open inside. Some would object to this, because they say the moulders would knock out the heads. Well, the moulder must be allowed some way of working off his excess of muscle, and perhaps swinging a sledge against the heads in a cylinder pattern is as cheap as any other method. If you cover over the joint he will soon make a hole through this covering with his rapping iron, then the pattern will fill up with sand. Put in the heads so that they will stand a good deal of pounding, fasten on the staves so that the moulder can't knock them off, then he may pound it all over inside without doing any serious damage. You may think that a rapping-iron should prevent all this, but the moulder will rap his pattern where he thinks it will stick the most, regardless of the rapping irons.

Of course it makes all the difference in the world who the moulder is. Some will pound everything, on principle, I suppose; even the inside of the rim of gear patterns doesn't escape their attention; and still, when you think of some of the patterns they are expected to get good, smooth castings from, perhaps they are not so much to blame. Pattern-makers are too apt to throw all the blame on the moulder, who might have made a much better casting if the pattern had been made to suit him. If you are to make a pattern for some new form of casting, better get the moulder's ideas on the subject, and tell him what you think about it. Very likely both will be benefited by this interchange of ideas, and you can get a better casting with less trouble all around. Isn't it more to your credit, and also to the moulder's, to get a perfect casting the first time, than only to get it at the second or third trial? You can't expect a moulder to be over particular about a moulding or pattern which has been constructed contrary to his expressed wishes. It is no more than natural for him to wish for a chance to say "I told you so," when the casting comes out bad. By keeping on the right side of the moulder, and perhaps feeding him a little "taffy"—not too much—we can make the pattern to suit ourselves, and thus get the credit of making the job quickly, and also making it well, because, don't you see, the proof of the pattern lies in the casting, and the moulder will make the casting. — But I am afraid we are getting our moulding done before the pattern is ready.

Let us turn up the body of the cylinder, keeping the size equal to the outside diameter of cylinder, as from *a* to *b*, Fig. 42, and cut in the flanges, giving at least a quarter of an inch under the size of print. If the flanges are to be changed, put them on with screws. After the glue has set (that is, if you use any), put the pattern back in lathe, and finish turning. I have not said anything about the parting, because the figures show it very plainly—line *m n*, Fig. 43. In some cases, it would be possible to mould valve-seat down, and thus do away with the steam-chest

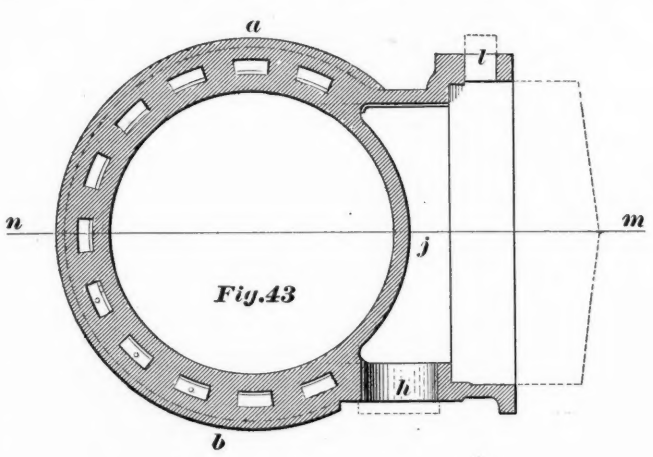


Fig. 43

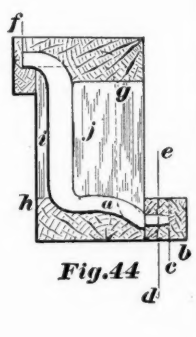
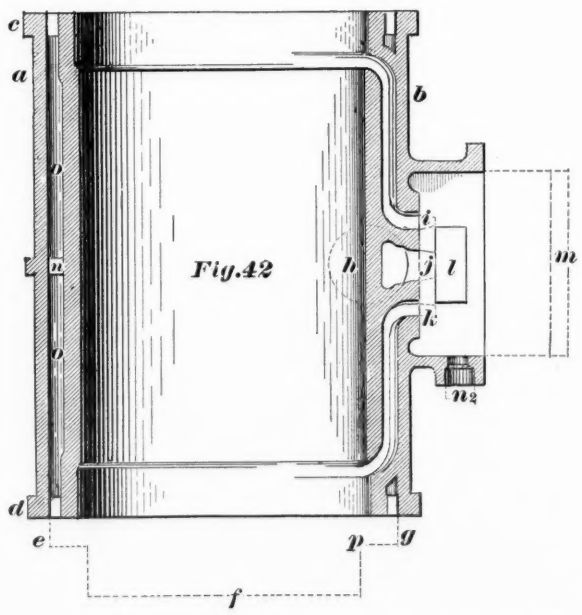
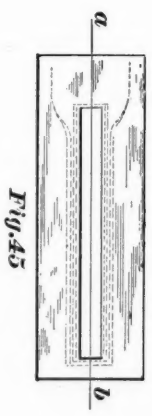


Fig. 44





PATTERN FOR STEAM CYLINDER.

core. Fit on the steam-chest, and whatever else there is to put on the outside, screwing everything fast from the inside of pattern. Here, you see, is another advantage of leaving the pattern open. If you covered it over, you would have to fasten everything from the outside, which would take more time, and not be as good when done.

You will notice that the core print for steam-chest—broken line *m*—has a good deal of draft on the end. This is to enable the moulder to set this core without disturbing the port cores.

When the pattern is done, give it a coat of varnish on the outside, and a coat of paint inside. If the outside is to be left wood color, take pains to keep it clean, else it will look bad when shellaced.

It probably isn't necessary to say that dirty varnish won't make the pattern look any better. If you put on black varnish it is possible to cover up a great many defects. Black varnish is like charity, it "covers many sins."

I like light-colored varnish, both as regards looks and actual worth. It makes a better surface than any colored varnish can, and consequently moulds better. I think, too, that a moulder handles a light-colored pattern more tenderly. If he is one who takes good care of the patterns entrusted to him and gets one to mould that shows good workmanship and moulds nicely (two points which always go together), he will use extra care in handling it; and if he is a moulder who doesn't care, and only works because pay-day is coming, he won't maul a light pattern so much, because a mark on its surface shows plainer and looks so much larger than the same one on a black pattern, and might cause him to lose all interest in the coming of pay-day.

Wherever you put in a screw, counterbore for the head, and then you can plug it up—the hole, I mean; not the head. But don't make your plug endwise of wood for a hole which is bored crosswise. Nails should be set down below the surface, and the holes filled with wax or putty.

For a large cylinder the body will probably be made without a box, so that the only thing we care to know about it, is the diameter.

The core for steam chest had better be made whole, for the top and bottom may not be alike, and a whole core is better anyway. The core is shown in Figs. 42 and 43. The bottom is first made with the valve seat built on it; also the part of cylinder body which forms the bottom of steam chest. The prints for steam and exhaust ports are shown at *i j k*. Then the four sides of steam chest are copied by the four sides of box. Take pains to have this core box the same length as print, otherwise the port cores won't come right. The top of the box is to be cut to match the draft on pattern. The four sides should be fastened together by screws; then after removing the screws you will perhaps find it a great help to draw each side away from the core by itself. It will enable you in a great many cases to do away with loose pieces, which you should always strive to avoid, as they are a perpetual bother. Give the prints for steam ports plenty of draft, so that they may draw clean, and also make it pleasant for the moulder in setting the cores.

Now the box for port cores. If the ports in valve seat are located centrally on the body of cylinder, and the steam ports are alike on both sides, one box will do for both cores. This box I have tried to show in Fig. 44, although in this case it would be necessary to have two boxes to avoid cramping the exhaust opening. The core is given an extra crook on the lower side to give the exhaust more room. To make the box get out the top *j* from *g* to *a* on a radius equal to diameter of cylinder, plus thickness of body, plus thickness of core. Then the bottom *i* on a circle the thickness of port core less, making a joint *a g* in top, and at *h* in bottom. The rest of the box is put on the opposite way of grain of wood, as plainly shown in the figure. This avoids the short grain you would leave at each end if you attempted to make the box all one way of the wood. You must be accurate in the dimensions of this box, else the core won't fit. The end of box next the cylinder should be cut to the circle of main core as may be seen by Fig. 43. The steam chest end should have the prints formed to closely fit the prints on valve seat. Care should be taken in laying out these core boxes, also the exhaust core box, to keep an even thickness of metal all round. This core box is to part at *c* and *f*. The print end of this box shows at *c*, whose finish is to be left in port openings to admit of squaring them up. The line *e d* is face of valve seat with finish added. The broken lines *a g* show the shape of core through center of box. This form is also shown in Fig. 42.

You may have to make two boxes, or two halves of two boxes, if the openings in valve seat are not located centrally on cylinder. This is not usual in slide-valve engines, but in vertical cylinders for marine engines with oscillating valves it is quite common, and for these the port cores are generally made in halves with the joint in same plane as joint in pattern. The box is built on a flat board which forms the outside edge of core, and the sides of box are cut through where the core runs parallel with the body of cylinder, usually at the outside end as at *g*, Fig. 44, so as to leave a piece of a length equal to the difference in length of the ports. This piece fits both ends and enables the core maker to make the half cores in pairs. The two port cores, the exhaust core and steam chest core, are all made together for this form of cylinder.

The exhaust core is another crooked box to lay out. Starting from the square opening in

valve seat, it goes down to body of cylinder, increasing in width towards the opening into pipe. This core is generally calculated to remove all superfluous iron between valve seat and body of cylinder. I have shown this core in section across the cylinder in Fig. 43; also a section lengthwise of cylinder is shown in Fig. 42 and a view parallel with valve seat is given in the figure of exhaust core box Fig. 45. This is a top view of box the broken lines showing the shape of core as it goes down towards cylinder and increasing in width towards the discharge at *a*, Fig. 45. This box parts vertically on line *a b*. You should have a print on the outside of steam chest to receive the end of this core, as shown by broken lines *h* in Figs. 42 and 43.

After you have completed these port core-boxes you will probably agree with me in saying that they are a crooked job, and also one, that to a certain extent shapes itself for the steam ports must not offer any unnecessary resistance to the passage of steam, and they must be kept close down to body of cylinder that the cylinder wall may also form the wall of port. The steam port must also be kept out of the way of exhaust. In short, these three holes are to be kept as closely together as possible, and must have an even thickness of iron all round to ensure a good casting.

If your cylinder is to have a steam jacket as at *o o o*, Fig. 42 and 43, there is also a box to be made for this core. Probably the most common way of supporting this core is shown by broken lines *e g*, Fig. 42. The square holes *o o o*, Fig. 43, form the connection between the jacket core and the print for same. This jacket core is made in two, four, six or eight parts, according to size of cylinder so that the cores resemble staves. Provision must be made in this box for the passage of steam ports through steam jacket, for connecting cylinder cocks for supports between body of cylinder and jacket, as shown at *n*, Fig. 42; also for any other points where the jacket core must be cut away. Make the stave for whatever part of a circle you wish to make to the radius of outside of core, and put sides on the box of a height just equal to the thickness of core. The ends must be as high as thickness of print from *g* to *p*, Fig. 42. The inner surface of core is to be made by a sweep resting on ends of box.

You will also want a box for steam opening in steam chest at *l*, Figs. 42 and 43, and a box for stuffing box where valve rod enters steam chest at n^2, Fig. 42. The print should be long enough to balance this core; otherwise the shape of core is plainly shown in the figure.

For very small cylinders I would make the port core, exhaust core and steam chest core, and possibly the body core, all in one core, in order that all the cores should come in the right places.

The American Government may yet wake up to find that European countries are getting ahead on torpedo boats. Such boats are cheap compared with ponderous ironclads.

The Library Committee of Congress have recommended the purchase of a picture of the battle between the Monitor and the Merrimac for $7,500. It seems to be a hard work, however, to get a vote of Congress to purchase the new invention with which the designer of the Monitor proposes to blow up all ironclads, little or big, or even to get an appropriation suitable to the adequate testing of this later invention.—*The Sun.*

A simple yet effective means for obtaining fine and clean castings in brass is reported as consisting of the addition of powdered glass to the contents of the crucible, when the metals are reduced to a molten condition. It is essentially necessary that the glass should be well mixed with the alloy, as it is asserted that all the impurities in the crucible are attracted by the glass flux, which floats on the top, thus enabling both the glass and the impurities to be skimmed off before the crucible is poured, leaving only the pure metal to be used for casting, and hence the excellence of the cast.

Early Engineering Reminiscences.

By George Escol Sellers.

TWENTY-FOURTH PAPER.

From all I can learn the early memorandums of drawing brass wire relate to a sizing of the wire, and not making it from the crucible or ingot. All imported wire of that period, when in long lengths, showed a perceptible difference in size, one end frequently being a full number larger than the other. This was supposed to be owing to the wear of the holes in the draw-plates, and not as it proved to be an accumulation of minute scales or hard matter in plates closing the holes and constantly reducing the size of the wire as it was being drawn. For laid moulds, wire of absolute uniformity was required to give a perfectly smooth level surface, hence the necessity of a careful redrawing of all imported wire for that purpose, in fact all the finer numbers for weaving the vellum faces were subjected to the same redrawing or sizing; frequently they were reduced from so much larger sizes as to require several annealings. But it was not this perfecting of brass wire that led directly to the annealing in closed vessels, important factor as it afterwards proved to be in the successful prosecution of that branch of the business. It was the difficulty experienced in drawing the finer qualities of iron wire suitable for card teeth, and for weaving into fine numbers of iron wire. The entire process at that time was of the crudest character. The wire rods, instead of being rolled as at present, were made from slabs forged at some one or other of the Pennsylvania charcoal furnaces, taken to a mill on Chester creek, rolled into flats, passed through slitting rolls made for slitting nail rods, leaving them about $\frac{1}{2}''$ square and not over 6′ in length. Grandfather induced the proprietor of this slitting mill to erect a furnace for reheating these rods and to have some grooves turned in his plate rolls, thinking that by passing two or three times through these grooves would give a good round wire rod; but it was not a success, the slit rods were rough and irregular on their corners; on passing through the rolls corner pins were driven into the rods not perfectly welded, so that the wire drawn from them was full of flaws. For a long time the process pursued was to take short heats on these slit rods on an open hearth, and draw into round rods in half round, wedges under a light quicks stroke trip hammer. The long and frequent exposure to the air caused a very hard scale to form on the surface, that had to be removed before passing through the wire plates. This was done by quick light strokes of a hand hammer, and by scraping; a tedious process requiring great care, for if the scales were not all removed, in the first drawing through the wire plate, they would either be indented into the rod or thrown off, and so fixed in the hole of the plate as to cause deep and unsightly scores in the wire that all after drawings could not entirely remove.

The drawing of rods into wire of about $\frac{3}{32}''$ diameter before using wire blocks or drums was all done by short pulls by nippers or linked pincers, operated by cams or studs on a water-wheel shaft against a wooden lever to which the chain to the nippers was attached; this lever was kept in contact with the shaft by a chain connecting it to a strong spring pole. Each stroke gave a pulling motion to the nipper of about 12″. The draw-bench was set at such an inclination that the nippers would return for a fresh grip by their own weight, opening their jaws sufficiently to allow them to slide under the wire down the incline, being kept in position by a stud on their under side that slid in a well-lubricated groove in the draw-bench, the wire remaining between the jaws, that were so shaped as to allow it to pass over the arms of the nippers, allowing time for them to close and take hold of the wire. The 12″ stroke gave about 11″ pull through the wire plate. Although this alternate pulling process had gone out of use long before my time, the old machinery had not been removed, and my grandfather fully explained the manner of its use. The plan was simple enough, but very defective, not only losing the time of the return of the nippers, but they would frequently fail to take hold of the wire, and always at every bite they would leave the marks of their teeth on the wire. This plan of drawing wire must have continued in use in England for the coarser kinds long after it had been supplanted in America by powerfully driven iron drums or blocks, for I well remember the tooth marks on imported wire, and so close together as to show their pulls were not over 3″ or 4″ long. It is hard for us of the present time to imagine the long continuance of this crude, jerking process before the adoption of the simple expedient of constantly-revolving drums, especially when we consider that the revolving wire block had long been in use for drawing the fine numbers of wire, and its adoption for the coarser wires was only a question of power and strength of the machinery.

If I am not greatly mistaken, the credit of this advance is due to Josiah White, to whom we are also indebted for the introduction of anthracite coal; the opening of the mines on the Lehigh, and its improvements to admit of running small coal barges. He created a wire mill at the falls of Schuylkill with a train of small rolls to run billets into round wire rods, and cast iron drums or blocks on which the wire was drawn, after having given a few pulls with the nippers to give length to clamp to the blocks. This was not invention but simply adopting by increased strength and power, what was successfully working on fine wire to the drawing of the largest. But had it not been for this advance, simple as it was, what would we do in this day of telegraphs, telephones and barbed-wire fences?

To return to the early wire drawing of my grandfather, he explained that as the wire was elongated as drawn by the nippers, he seized and coiled it by hand into rings of a suitable size for annealing. He was not long in discovering the great waste by oxidation from the frequent annealing in open furnace, that on the coarser wires the scale was removed without seriously injuring the wire by steeping or boiling in vats of very dilute sulphuric acid, which at that time was a costly process, but some saving was made by evaporating the spent liquid in the shape of the residuary copperas or green vitriol, but as the wire was reduced in size, the effect of the acid was very injurious, causing much waste by breakage in drawing fine numbers, and sometimes rendering it so brittle as to unfit it for card teeth, not only breaking in bending the teeth, but in after use the cards breaking off close to the leather. Some mode of annealing must be devised to prevent contact with the air and oxidation.

The first experiment he tried was to reel the wire into coils of about 1′ diameter, with a body of 2″, which he firmly bound with wire, making it as compact as possible. This he encased in well-ground and worked clay, such as is used for brick-making. He was careful in selecting his clay to have such as would not harden and self-glaze at a temperature so high as to effectually anneal the wire encased in it. After slowly cooling, this outer casing was broken off and the wire cleaned by heating, when it was found almost as bright as before annealing.

The next move was to turn on a lathe soapstone rings, half hollowed out to receive the coil of wire, encasing it. When two of these rings were closed together, the union being made tolerably air-tight with finely-ground soapstone, making a dry luting, they were placed in a dome furnace, the lower one resting on iron bars. Five or six of these rings placed one above the other, separated by small soapstone blocks, filled the furnace. When heated to a proper temperature, the fire was drawn, the dampers closed, and they were allowed to cool in the furnace, for it was found, if taken out, to recharge the furnace with a fresh set, and they were allowed to cool in the air, the soapstone rings rapidly disintegrated. The wire annealed in these rings was not as bright as when encased in clay; the confined air was just sufficient to blue the wire, without forming any injurious scale to injure the draw-plates. As to quality of wire, all that was desired was obtained, but the maintenance of the soapstone rings and loss of time in cooling in the furnace was too expensive. To obviate this, a Mr. Miller, who was at that time carrying on a pottery for the finer qualities of earthenware and fire tiles, made a number of fire clay rings that was an improvement on the soapstone, as they did not injure by quick cooling, and could be taken out of the furnace and a fresh charge put in without cooling down. This success led to experimenting with cast-iron annular annealing pots; they were from 12″ to 14″ deep, with annular space of from $2\frac{1}{2}''$ to 3″. The wire was reeled to a size to fill this space, and so loosely bound that when driven down with a wooden rammer and hand mallet they filled the entire space to the exclusion of the air, as much so as when encased in clay. The top of this annular space, when filled within about 1″ of the top, were closed with sectional iron plates, well luted.

When I took my first lessons in this process, charcoal was used as the fuel, but it soon gave place to anthracite coal, except for the finest numbers of brass wire. The furnace was of the simplest possible construction, circular, with dome-top annealing chamber, while the pots were placed on a couple of iron bars extending across the furnace sufficiently above the bottom of the charging door to admit of an iron forked lever carrying the pot to pass in and seat it, and again to be used in removing it—the fire immediately under on a grate, as in the common cannon stove. Over and close to the fuel was a flue opening into the main flue; this was closed by a damper when the fire was well ignited, and the entire heat thrown into the annealing chamber, passing through the center and around the outside of the annealing pot—the draft through the chamber being regulated by a circular flue in the apex of the dome that opened into a close chamber. Connected with the main flue, over this circular flue, was suspended a long truncated cone, made of soapstone, so arranged that it could be raised or lowered from the outside of the furnace, leaving an annular opening around it, which could be increased or diminished with great accuracy, and thus perfectly regulating the heat within the annealing chamber.

In the first experiments, the management of this conical damper seems to have been one of great nicety until perfectly understood. To test the furnace for uniformity of heat in the annealing chamber, a very ingeniously constructed double gridiron pyrometer was used, having one set near the sustaining bars in the lower portion of the chamber, the other near the apex of its dome. The fire and the damper were so worked as to have the index hands of this double instrument coincide; this was only used in acquiring a perfect knowledge of the manner of working the furnace. In the first annealing of fine brass wire in the annular pots, two cupels were placed side by side, with a button of fusible alloy on each, one that would melt at a temperature sufficient to thoroughly anneal the wire without danger of melting it, the other to melt at the danger point, which the operator had to be careful not to reach. Careful practice soon taught how to operate with safety, trusting to eye sight right through the peep-hole in the door, and judging by the color of the annealing pot, which, when it arrived at the proper heat, the dampers were closed and time given for the heat to penetrate the entire mass of encased wire; the average time required to anneal a pot was about one hour. One man with a long, forked, iron lever, suspended by a chain to a crane, would with ease withdraw the hot pot and replace it with a cold one.

I have been thus particular in describing the early practice of my grandfather in annealing both iron and brass wire, believing, as I do, that the credit of the experiments that lead to the use of close iron annealing pots is due to him, and that England is indebted to America for an advance that not only improved the quality of their card tooth wire, but made considerable saving from the waste of oxidation and its removal by the acid pickling process. The principal proprietor of the English works I alluded to in my last paper told me that he had served his apprenticeship at them. He would not give the exact date of their commencing the use of the

close annular annealing pots, but he was confident that it was prior to 1780, or about that period, for they then commenced furnishing the firm of N. & D. Sellers with card wire, they having given up the iron wire-drawing branch of their business. That, on the receipt of the first order for card wire, and fine numbers of iron wire for weaving, Mr. Nathan Sellers made it an indispensable condition that no acid should be used after the wire had been reduced to No. 14, that all after annealings required should be done in close pots, or annealing kettles, as he called them, to exclude the air, and to enable them to do this he sent them sketches of his furnace and pots, and gave an account of the experiments he had tried that led to their adoption. At the time of my visit this firm had been the agents of and regular correspondents of N. & D. Sellers and their successors for over 60 years. They had carefully preserved the old sketches, which were shown to me, and which I at once identified as the work of my grandfather. They unfortunately were not dated, though reference to some of the early correspondence fixed the date about as above stated. The advantages of annealing the finer qualities of iron wire excluded from the air, was considered of such importance to the concern that for a quarter of a century that portion of their work was done secretly by a member of the firm and one or two confidential workmen. From the most reliable information I could obtain it was not until the beginning of the present century that other wire works adopted the pot or retort system of annealing, and then it was introduced into England by French workmen from the manufactory of Messrs. Mouchel, of the department of L'Orne, France. What struck me as most extraordinary was that a concern who for so long a period had successfully annealed their iron wire for card cloth and fine steel wires for musical instruments, had so utterly failed in every attempt to anneal fine brass wire. They said the lower coils in the pots were certain to melt and run together, when the upper ones would not be sufficiently annealed to draw well.

After having their furnace remodeled, I admit to having found considerable difficulty in getting up and maintaining a perfectly uniform heat with coke as the fuel, it requiring a different management of both the lower draft and the conical soapstone damper; but after a little practice I made the venture successfully with a pot charged with brass wire of a number fine enough to weave into vellum wire of 80 meshes to the inch.

As late as 1832 some of the English wire mills were still annealing their coarse wires in the flames of a reverberatory furnace, and wasting stock and injuring quality by severe vitriol cleaning, and others that were using retorts or pots did not charge them to exclude the air as effectively as it should have been done for saving in the vitriol process. Two extensive card-wire mills that I visited were exercising the greatest possible care in charging their pots and luting them, bringing the wire out in condition for the wire plates without the use of acids to an injurious extent.

In his new annual report, Mr. Redgrave, chief inspector of factories, says: "Mr. Bartlett, Redditch, referring to a paragraph of my report for 1884, in which I had expressed a doubt whether it were possible to prevent the breaking of grindstones used in the cutlery trade, has sent me a recommendation, which I am glad to mention for the information of users of emery wheels, especially grindstones. Mr. Bartlett says: 1. 'Lay in the stock of grindstones not later than the middle of July, in order that they may have ample time to dry in the sun and air. To do this they must be placed where both sun and air can get to them, and they must be put on their edges on pieces of boards, not on the earth, so as to avoid the absorption of any moisture. 2. As soon as dried thoroughly, they should be placed in the rooms in which they are intended to be used, or in a dry storeroom, and not be allowed to come in contact with soil or get damp again. 3. Before being used, each stone should be tested in a strong wrought iron testing box, and driven at a greater speed than when in work. 4. The stones above 9 inches in diameter should be hung with side chains or plates instead of being led on their spindles. By the adoption of this system, we have had no accident for twenty years.'"—*Industries.*

Dock Trial of the U. S. S. Boston.

On the 7th of July the engines of the new steel cruiser Boston were put in operation preparatory to a full-power trial. They were run during the day at 32 revolutions per minute; vacuum, 16.25; steam pressure at cylinders, 40 lbs. The high-pressure crank-pin heated slightly, and required a small stream of water running upon it. After running for several hours, it was found necessary to remove the brasses and scrape them down to a bearing. These brasses were afterwards filled with Baker's white metal, the engines started again, and kept in operation with an increasing rate of speed until the 17th, when a maximum of 54 revolutions was obtained. The brasses were then scraped a little, and the preparations for trial continued until 9.30 P. M. of the 20th, when the trial was actually commenced.

The engines were speeded until 4.30 A. M. July 21. During the seven hours an average speed of 55.3 revolutions was maintained; pressure of steam at cylinders, 80.3 lbs.; vacuum in condensers, 26.3″. The steam was cut off in H. P. cylinder at 13″ from beginning of stroke; in forward L. P. cylinder, at 9″; and in after L. P. cylinder, at 8.5″ (length of stroke, 42″). The horse-power developed during the trial was 2008.6.

Considering the fact that the machinery of the Boston is new, and that the vessel was lying in a bed of mud alongside the dock, the performance is considered satisfactory. At one time during the trial she attained a speed of 62.5 revolutions per minute; this is considered by naval engineers as equivalent to at least 72° in deep water, with the ship under way.

The air-tight fire-rooms were also tested, and proved satisfactory. The forward fire-room, containing four boilers, was supplied with air from three Sturtevant blowers; two situated in galleries in the fire-room, and one on the berth deck. They were run at a speed of 600 revolutions per minute; an air pressure, equal to 1.05″ of water, was maintained, and a temperature in fire-room of 114°. Similar results were obtained during the trial of after fire-room.

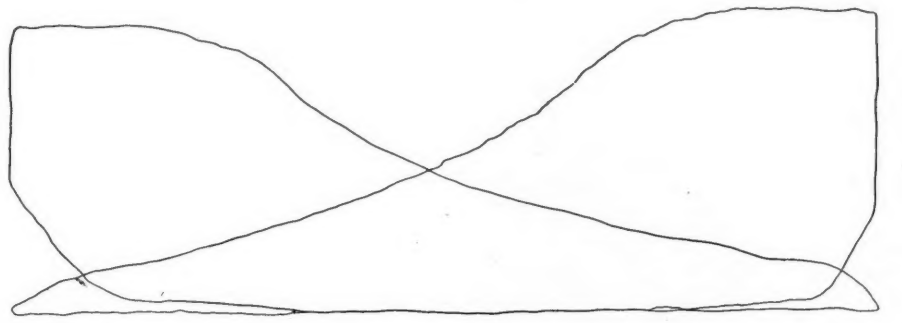
The heating of the high-pressure crank-pin of main engines was not surprising when it is understood that the high-pressure cylinder was developing about one-half the entire power.

The horse-power as given above is independent of that developed by the eight Sturtevant blowers, two independent air and circulating pumps, one auxiliary air and circulating pump, one independent feed pump, and one large compartment pump running on the bilge. These pumps and blowers developed 310.5 horse-power, making a total of 2008.6+310.5 = 2319.1.

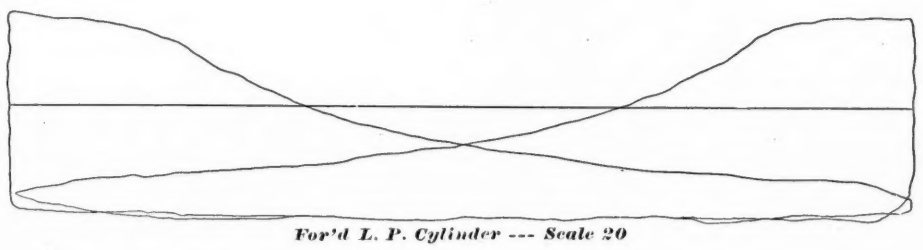
The Boston is built entirely of steel furnished by the Chester Rolling Mills.

Length between perpendiculars...	270′
Beam (extreme).....	42′
Depth of hold.....	25′ 8¼″
Mean draft on load water line.....	17′
Displacement at load water line....	3,050 tons

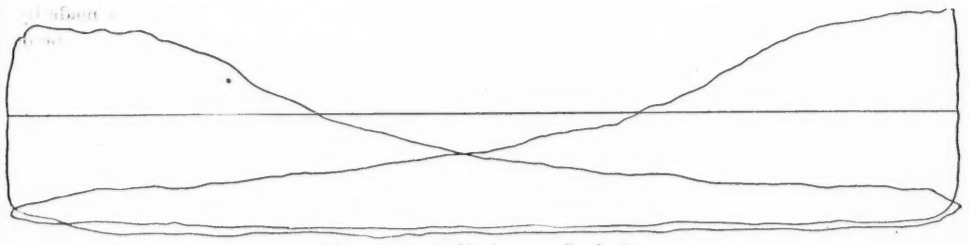
She is built in 77 distinct water tight compartments, and has a steel superstructure deck extending one-half the entire length between bow and stern.



H. P. Cylinder --- Scale 40



For'd L. P. Cylinder --- Scale 20



After L. P. Cylinder --- Scale 20

Her battery will consist of two 8-inch breech-loading rifled guns having a range of about 245° around the horizon; six 6-inch breech-loading rifles of high penetrating power, and six Hotchkiss revolving cannon. She is fitted with all modern improvements, including a thorough system of electric signals, lights and bells, engine annunciators, capstans, ash hoisters in each fire room, steam steering gear operated from the pilot house, fighting tower on main deck, two large Sturtevant blowers for drawing foul air from the quarters of officers and men, and six similar blowers for forcing air into fire rooms, running water in every room, and bath rooms in cabin, wardroom and steerage.

Her machinery consists of eight cylindrical boilers, 11 feet 8 inches in diameter, and 9 feet 9 inches long, divided into two groups of four each, each group situated in a separate air-tight fire room. There are sixteen furnaces, 382 square feet grate surface, and 8,920 square feet of heating surface. The boilers are to stand a working pressure of 100 lbs. per square inch; they are built entirely of steel. Her propeller is of cast-iron, 17 feet diameter, four blades. Mean pitch, 24.34 feet. She has one high and two low-pressure cylinders.

Diameter of H. P. cyl., 54 ins.
" " L. P. cyls., 74 " each. } Stroke of pistons, 42 ins.

The engines are horizontal back-acting.

There are two air and two circulating pumps, one of each coupled together, and arranged to work independently or connected with the main engines. There are two surface condensers and an auxiliary condenser, with a cooling surface of 8,806 square feet; two Delameter compartment pumps, capable of discharging 1,500 gallons per minute each.

Diameter of steam pistons.....24 inches
" " water " .....20 "
Stroke.....18 "

She also has auxiliary pumps for feeding boilers, supplying water tanks, bath tubs, etc.; and also for distilling fresh water.

The appended indicator diagrams were taken July 20, 11.30 P. M. Data as follows: Revolutions, 56; steam pressure, 82 lbs.; vacuum, 26½ inches; pressure in receiver, 10½ to 12 lbs.; temperature injection water, 85°; temperature discharge, 105°; temperature hot well, 95°; throttle wide open.

Engineering Wants.

Since the experiments of Morin on friction, we have had comparatively nothing in the way of increasing general knowledge of the subject. These experiments were extremely valuable, but their value is outgrown by present practice, just as the accomplishments of Watt in the direction of the steam engine have been outgrown. In the present engineering practice in regard to the proportions of journals and wearing surfaces, lubrication and speed, deductions from Morin's experiments are found to be of little or no use in calculating friction. What is wanted is new and extended experiments directly in line with present practice, from which to formulate new rules for everyday use.

Attention was specially called to this lack of a knowledge of even approximate laws of friction by the results of a steam-engine test at the fair of the American Institute, two years ago. In this test the engine was found to work through a large range of power, with little or absolutely no increase of friction. There were no extraneous conditions that would modify results, and in the machine itself nothing but ample, well-fitted bearing surfaces, which is common practice nowadays. According to the generally accepted laws, friction ought to have increased with the load, but numerous careful experiments showed that it did not. The fact only was established, no reason that would be of use in other calculations. This is only one instance of many, where calculations made beforehand were, or would have been, absolutely worthless.

Another thing in which there is great lack of reliable information is the expansion of metals by heat. The experiments from which data have been obtained were made under unfavorable conditions, as compared with what could be had at the present time, and as a result conclusions are unsatisfactory and contradictory. With the refined means of measurements now in use, there is little doubt that experiments could be made that would give results practically correct.

Means of measuring high temperatures is also much needed. Text books do not pretend to give more than an approximation to the melting points of most of the metals, and furnace temperature is almost a matter of pure conjecture.

These things ought to be brought at least within the limits of approximate calculation; and with approved means of working, now so well known, it is reasonable to assume that they might be, by the expenditure of only a small part of the effort that was required to furnish the present unsatisfactory knowledge of them.

The *Oil and Drug Reporter* has an article headed, "Beware of Loaded Sponges." A loaded sponge is not a new weapon adopted by the Anarchists, but an adulterated article sold for harmless use. The load consists of litharge lime and sand, and makes the sponge sell higher by reason of its increased weight. The consumer is, of course, deceived.

White's Hoist.

This hoist is manufactured by William Wharton, Jr., & Co., Philadelphia, Pa. It consists of a double gyrating gear, meshing with a stationary circular rack, and also with movable gear, the latter being attached to the lifting sheave. The gyrating movement is produced by an eccentric attached to the hub of the hand wheel, to which power is applied. The result is a differential movement of great power, sustaining the load at any point.

It is claimed for this hoist that it weighs less than others of equal power; that its parts are entirely protected from dust; that it will lift nearer its point of suspension; and that its construction enables lifting to be done at either end of the chain, thus saving time.

Report of Master Mechanics' Committee on Balanced Slide Valves.

This committee, through Mr. Blackwell, made a lengthy report. In reply to the question as to what roads were using balanced valves, and what kind, a large number of replies were received from master mechanics, some of whom reported nearly 300 balanced valves in use on their roads; various kinds of valves were reported as in use. Some favored one kind of valve and some another.

To the question, "What is the cost of these balanced valves and necessary adjuncts per engine compared with the ordinary valve?" the following answers were received:

Mr. J. Davis Barnett states that if standard sizes are adopted throughout, and milling tools used on the work, the total extra cost per valve will not exceed five dollars.

Mr. Allen Cooke states that the first cost of equipping an engine with the Richardson balanced valve is about as much again as with the common valve.

Mr. Harrison states that it costs twelve dollars per engine to apply the Beckert attachment to the old style of valve.

Mr. Meehan, through Division Master Mechanic Tomlinson, states that the cost of each of the three valves used on his road is about double that of the ordinary *D* valve, the Margach probably being the most expensive, and the Richardson the cheapest, royalty being equal.

Division Master Mechanic Fowle agrees with Mr. Tomlinson as regards the relative price of balanced and ordinary *D* valves.

Mr. C. E. Smart states that the Richardson balanced valves and necessary adjuncts cost nearly four times as much as the ordinary slide valves.

Mr. Thomas B. Twombly states that the cost of the balanced valves as used by him over that of the ordinary valve is about eighteen dollars per engine.

Mr. William Woodcock reports the cost of balanced valves per engine to be ninety dollars, and that of ordinary valves ten dollars.

To the question, "What is the average cost per engine per annum of maintaining these balanced valves and their seats? give figures applicable to each 12 months after valves were placed in service until their renewal was required; give similar figures in the case of ordinary valves on the same class of engine, and, if possible, mileage made each year?" the following answers were received:

Mr. Barnett states that the cost is variable; that he has run for two years without breaking steam chest joint, and at other times springs had to be renewed within a month or two. He estimates the average cost of maintenance to be not more than three dollars per valve.

Mr. Cooke reports the cost of repairs for two years and eleven months in the case of engine 42, fitted with Richardson valve, $4.50 and which was for one facing the seats. He states that with the ordinary valve, seats required to be faced every five or seven months.

Mr. Harrison states that none of the Richardson or Beckert valves have been running a year, but up to the time of his report the cost of maintaining the Beckert valve had been comparatively nothing. The Richardson valves had seats of left cylinder faced off three times since it was put in, and had end balance strips broken in two once.

Mr. Meehan, through Division Master Mechanic T. W. Fowle, reports that the average cost per engine of maintaining the balanced valves the first twelve months after they were placed in service was one dollar. He has no engines of the same class equipped with ordinary valves, and is unable to give cost of their maintenance.

Mr. George W. Stevens states that from observation it is quite evident that the cost of maintaining the Richardson valve will not exceed that of the plain valve.

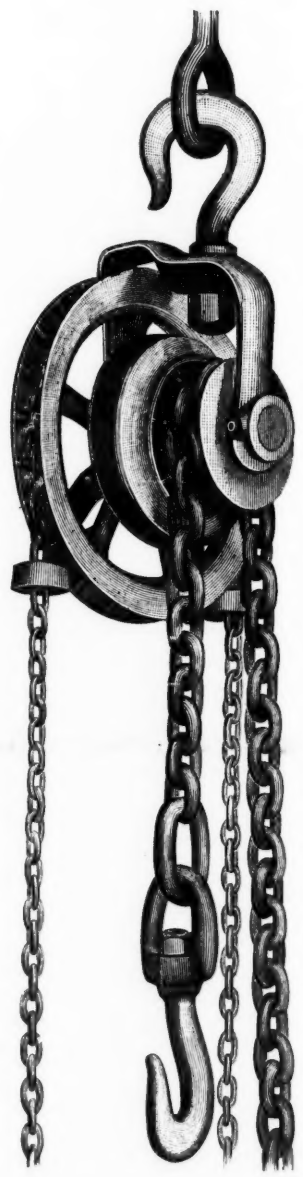
Mr. Twombly reports the average cost of maintaining the valves as used on his road to be eight dollars per annum; that of the ordinary valve ten dollars.

Mr. Woodcock reports cost of facing seats and valves at five dollars.

To question 6, "What mileage is represented by one-fourth inch wear of valve seats of similar engines when using and when not using the balanced valve, and state if vacuum valves were used in each case on steam chests?" the following information was received:

Mr. Allen Cooke reports placing Richardson balanced valves on engine No. 42, a Mogul with 18 by 24 inch cylinders, on January 29, 1883. On August 11, 1884, after running 50,922 miles with freight trains, and hauling 42 loaded cars in summer and 35 in winter, the valve seats were faced, the wear having been one sixty-fourth of an inch; the engine then ran until the 31st of December, 1885, making 44,925 miles additional, when she was shopped on account of accident, but required no work to valves or seats, neither to links, pins, or valve gear, as there was no lost motion to be taken up.

Mr. Meehan's Division Master Mechanic, Mr. Fowle, states that during the fifteen months his Mogul engines have been in service with the Delancy valves he has not had occasion to face a single valve, and they are all now in first-class condition, and not one of them will show one thirty-second of an inch wear.



WHITE'S HOIST.

Mr. Woodcock furnished a tabular statement covering the performance of ten passenger engines fitted with the Richardson-Allen balanced valves. He gives 41,663 miles as the average for one thirty-second inch wear.

DISCUSSION.

Mr. Chas. Blackwell—It seems to me that Mr. Woodcock ought to be able to give us some very valuable information. It seems from his report that by the use of the Richardson balance valve he has effected an economy in the wear of seats and valves amounting from 700 to 1,400 per cent. That seems almost incredible. I think, however, that the valve that first gave him so much trouble was the unbalanced Allen valve; but I would prefer asking Mr. Woodcock to give us some particulars, rather than to quote from anything that he has told me about it.

Mr. Woodcock—I think Mr. Blackwell misunderstood me in reference to using the Allen valve unbalanced. We did not do that. I said that I thought the Allen valve put into our engine No. 169 was the first valve balanced with the Allen device. What made the great difference in the wear was using the common solid valve. We faced those seats probably after running six to eight weeks; and the matter became serious to my mind as we soon had to renew the cylinders; and looking around, I thought we would test the matter of balance valve previous to making another arrangement, and I did. I had some correspondence with Mr. Richardson; and he agreed to balance one of the Allen valves for trial, and he did. Those valves have run from twelve to eighteen months without facing. That is where the difference came in. It was the difference between the original plain valve and the balance Allen valve. You will remember that these valves are in service on high speed passenger engines, where the service is severe; and it became a serious matter with us in reference to getting a valve that would run some length of time, and thus save taking the engine out of service, or facing the valve. I can only say that the valves are working very satisfactorily, and I should be very favorably inclined to place more of them in service.

Rolling Window Glass.

A Pittsburgh mechanic, who desires that his name shall be withheld for the present, has secured by affidavit the priority of claim to a patent for a new process of manufacturing window glass which bids fair to revolutionize that industry. The new process simply consists of rolling the glass exactly as iron and steel are rolled instead of blowing it.

By this process the molten glass is brought in a ball from the furnace and conveyed over movable iron plates to the rolls. These plates are heated underneath by natural gas flames issuing from a net-work of perforated pipes, thus maintaining the glass at a malleable heat and at the same temperature throughout its surface. The ball is then rolled into a sheet by the two-high reversible rolls. These rolls are hollow and have a fixed natural gas pipe running through them, perforated all along. The flame from these pipes maintains the rolls at a high temperature, so that they preserve the malleability of the glass during the process of rolling.

The sheets pass from the rolls to a movable plate heated in the same way as that over which they passed to the rolls, so that they are not allowed to chill. They then pass to the annealing furnace, are rubbed until the surface is smooth, just as plate glass is rubbed, and then go through all the same processes as blown window glass. It is claimed that ten times as much glass can be produced by this process in a given time as by blowing it.

No practical test of this process has been made yet, but one will be made as soon as a patent is secured. Old and experienced glass-workers say that the rolling of window glass is perfectly practicable by keeping the glass hot during the operation of rolling. William Clark, of this city, tried to put the same idea into practice thirty-five years ago, but failed because the glass chilled so rapidly after being rolled that it became too brittle for use. The inventor claims that he will overcome this difficulty by using natural gas to keep the sheets hot.—*National Labor Tribune.*

Engineers and architects in this country may sometimes receive secret commissions on the sale of machinery and supplies recommended to their clients, but the practice is not common. In England it seems to be quite common. The *Ironmonger*, of London, says: "It may, perhaps, be a little difficult to prove a charge of the kind against any particular architect, owing to the *sub-rosa* fashion in which these 'customary commissions' are stipulated for and handed over; but that the practice is a very common one indeed, is only too well known to the manufacturers of builders' ironmongery, stove grates, and other classes of goods used for structural purposes and furnishing. It may be that the Royal Institute of British Architects is officially unaware of the evil of which we complain; but it is certainly notorious that the thing is done every day, and that there are scores of architects, and some engineers who are by no means bashful in arranging the little details of the backsheesh thus levied. The remedy is obvious. It rests with the employers of architects to enforce it. Henceforth every one who employs an architect should insist upon a clause in the agreement between them that no commission, present, allowance, gratuity or charge in any form should be received or receivable in respect of any article or material used in the work to plan and supervise which the architect is engaged."

Water companies in London have got so exorbitant in their charges that the boring of artesian wells is all the rage. It has been demonstrated that wells can be tubed to almost any depth, and still furnish water cheaper than the water companies will furnish it.

"Nothing but the figures should ever be allowed on the dial of a steam gauge." We clip this from "Useful Hints and Information for Steam Users." If some one would enact this maxim in every State in the country, engineers would bless them. Usually the most prominence is given to the maker's advertisement on a steam gauge.

The *Roller Mill*, of Buffalo, for July, has 52 pages printed in several different colored inks. It lavishly devotes a quarter of them to reading matter. It places Buffalo second among the flour-producing cities of the United States, being outranked only by Minneapolis.

Oil's First Cousin.

That sprightly monthly, *The Accident News*, is disposed apparently to class natural gas, or as it calls that volatile agent, "oil's first cousin," among the happy accidents. On this supposition natural gas clearly belongs to our accidental but clever contemporary's domain. It says:

The area of territory from which natural gas comes is to a great extent identical with that in which the best oil-wells are found. Thus the relationship of the two combustibles is established. There are gas-fields, however, outside of oil-fields. Arkansas and Colorado gas-wells have been opened with good results, and nobody knows where gas may next be struck. It is in vain for miners or geologists to lay claim to profound wisdom in the matter, and say that it is here or there or anywhere. For these learned persons never knew much about it before it began to flow, and there is not one of them who can, with any degree of certainty, prophesy where the next well will be struck. Nor does the most scientific man on earth know anything about the birth of this gas. Whether it has been for countless ages in the reservoirs from which it now gushes, or whether it is formed by some chemical process to order, as wanted, nobody knows. It may lie in pockets which are soon to be exhausted. Or there may be a never-failing store of it, which can always be depended upon. Concerning these matters the most profound essays of scientific men are simply guesswork. The world is in the dark awaiting revelations.

The Orange City (Texas) *Tribune* has the following suggestive paragraph:

"Houston feels secure now in the shops for the Southern Pacific. Wonder if Marshall could not give them a bit of advice gratis. Marshall subscribed and paid up a large sum of money, bought and gave to the Texas Pacific acres of land. The shops were built and run until the road fell into other hands, when the new management ignored the former agreement and moved the shops to St. Louis. We hope our Houston friends may not have to mourn the loss of their donation in as short a time as did the Marshall people.

The cost of delivering flour from the Minneapolis mills to Glasgow or Liverpool including insurance and all charges between the two points does not exceed 75 cents a barrel the year round.

The wire nail manufacturers recently held a meeting in New York and adopted a price list of sizes and varieties which will be a guide in the trade. The base price was fixed at $3.75 per keg of 100 lbs. for 10d. The wire nail industry is a growing one.

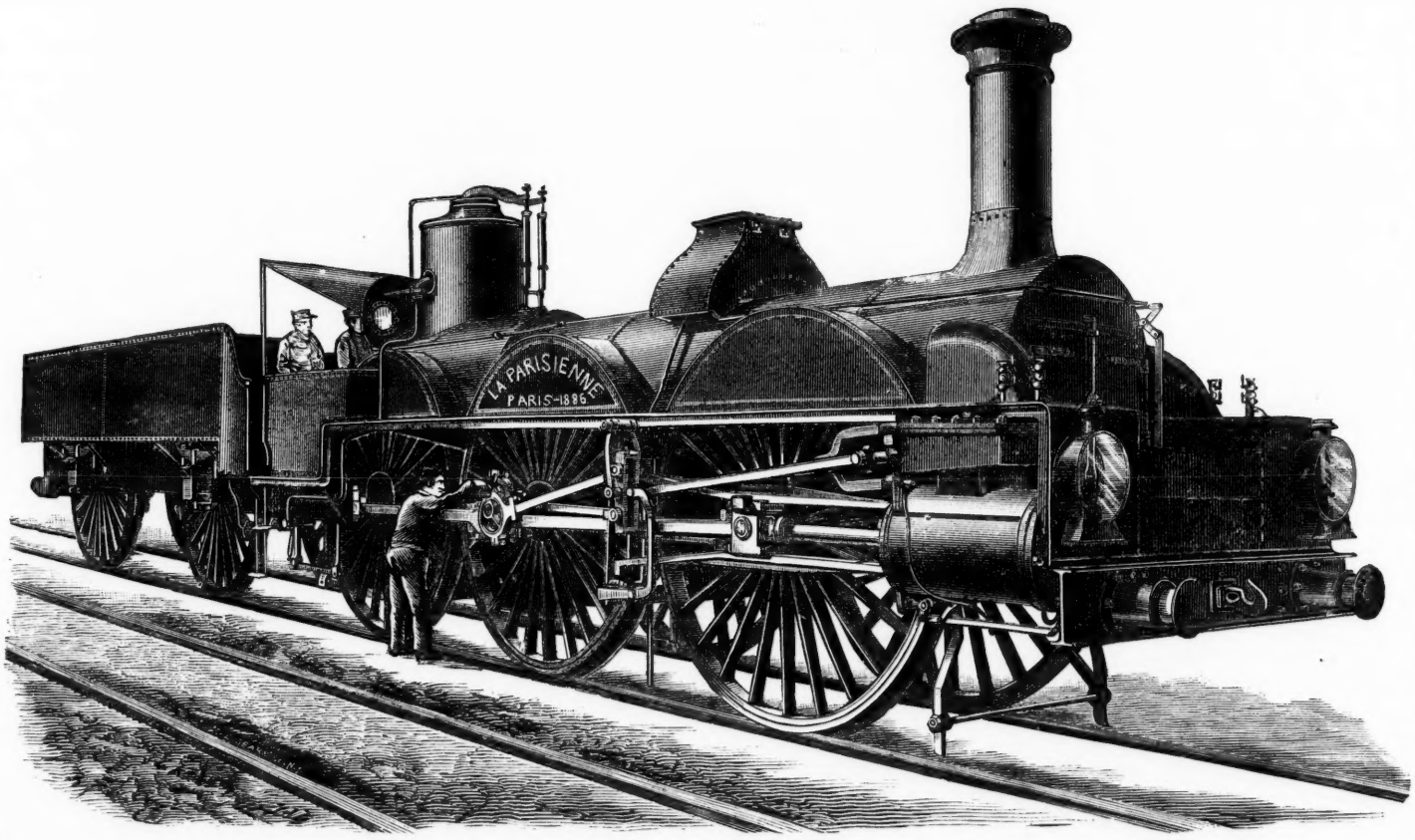
Giant Locomotive "Parisienne," by M. Estrade.

A French engineer, M. Estrade, formerly a scholar at the Ecole Polytechnique of France, has given a great deal of attention to the improvement of the rolling stock of our railroads; especially to the motive power of locomotives with a view of obtaining an unusual high rate of speed, guaranteeing safety, security and economy.

For obtaining them the inventor takes as a principle, driving wheels of a large diameter attaining thereby the greater speed, which is desirable. The problem placed before us shows great difficulties to be overcome to arrive at a practical solution; therefore the project of M. Estrade has raised a great deal of controversy.

The considerable dimensions of a locomotive of this description, and the coupling of the driving wheels have made a great many fear that a locomotive of this kind would not have sufficient stability; that it would be exposed to dangerous oscillations and would not be able to round usual curves of a railroad with security.

A good disposition of the parts and the system of a double suspension have been studied by the inventor, assuring stability and doing away with oscillation to a great extent. To facilitate the rounding of curves the front axle of the locomotive, although coupled with the others, is supplied with an articulated grease box; therefore M. Estrade is convinced that by slacking the speed it is feasible to round all usual curves. In the meantime this immense locomotive was not invented or destined for the use of short railroad lines. It must have space such as on the direct and long railroads of Russia, Asia and America where there are great necessities for traveling with rapidity from one great center to another.



GIANT LOCOMOTIVE—"PARISIENNE."

Let us add that all French railroad lines do not lack in their systems roads which have for hundreds of kilometers easy curves.

To be able to refute the objections made against his project the inventor caused to be constructed at his own expense—a measure which unhappily a great many inventors do not have the means to carry out—a full sized locomotive and tender at the shops of Messrs. Boulet & Co., constructors at Paris. The model, being only one-tenth of actual size, has been deposited with the Conservatory of Arts and Trades. The locomotive is ready for its trial trip. M. Estrade has solicited, with all security, the authorities to have his engine run on one of its lines and to be controlled by authorized engineers. The locomotive, mounted on her six large wheels, is on exhibition at Messrs. Boulet & Co.'s, and is strikingly powerful, as can be seen by the following:

Principal dimensions:

Total length of locomotive	32.64 feet.
Width	4.06 "
Diameter of wheels	8.20 "
Weight of engine	38 tons.
" " " loaded	42 "

We regret not having the details of the absolute strength of this engine or its power of traction. The inventor expects to easily attain the speed of from 75 to 80 miles per hour.

The engine is only the principal instrument of his project. He will give at the same time to all railway carriages, wheels of the same dimensions as the locomotive; counteracting to a great extent the resistance of friction and movement, which are excessive, owing to the material in present use.

We wish to this French invention a complete success.

The description above we translate from Paris journal, *Cosmos*.

LETTERS FROM PRACTICAL MEN.

Ojections to Taxing Patents.

Editor American Machinist:

The evident acuteness and fairness of the writer of the article on Patent Law Reform, in the issue dated July 31, make the injustice and unfitness of the remedy for the evils he has so clearly pointed out seem all the more prominent.

The proposed tax would weed out, not poor inventions but poor inventors. A more rigid examination of the claims of alleged inventors by a larger and better equipped corps of examiners, and an application by them of the more simple and easily applied rules concerning patentability laid down by the courts (if any rules on this difficult subject may be so called) would cut down the number and increase the individual value of patents immensely. No patent, however frivolous, would be killed by such a tax as proposed if it should be owned by a large concern who could make it in the slightest degree instrumental in shutting off competition; and further, justice demands that the really meritorious inventor should secure the reward of his ingenuity at the least possible cost.

Reform lies in the direction of a strict regulation of the issuance of patents, not in an indiscriminate destruction thereafter.

JUSTICE.

Poole's Roll Grinding Machine.

Editor American Machinist:

To those who are at all familiar with the work done by the Poole roll grinding machine, as described by Joshua Rose in the AMERICAN MACHINIST of July 3d, the letter of C. A. Smith, July 24th, criticizing it, cannot be less than amusing. It has been my good fortune to see a good deal of fine work done both by hand and machinery, and I can call to mind no other piece of work so difficult to do as to produce a perfectly round and parallel cylinder of sizes ranging from 5 inches to 12 or 16 inches in diameter, and from 2 to 6 and perhaps 10 feet long, and finished completely by machinery that is so perfect as the rolls finished by the grinding machine Mr. Rose describes. I believe a job of this magnitude, done on the single wheel machine Mr. Smith mentions, would no more compare with the J. Morton Poole rolls than good lathe work would compare with work done on the single wheel machine.

So far as I can remember (I saw the machine ten years ago) Mr. Rose's description is substantially correct, although in the details of their method of using, it is not complete. After the lathe work on the roll is finished the journals are ground on dead centers, and I believe any one who tries the experiment will be quite content if he succeeds in getting the journals round by grinding on centers to say nothing about grinding the entire roll. Absolute parallelism is not an essential requirement in the journal as is the case with the body of the roll, in fact in the case of paper rolls aside from using the journals as a bearing in the grinding machine, I fancy their accuracy is of secondary importance. The difficulty in doing the entire job on centers comes from the fact that the centers, with the enormous load upon them, will wear and almost invariably change their position as the wear takes place.

Mr. Smith thinks the entire job should be done on the same centers to insure the body of the rolls being concentric with the journals. The centers (I refer to the countersunk centers in the end of the roll) wearing, and, as is likely, wearing towards one side, would insure the body of the rolls being eccentric with the journals, whichever was ground first.

One attachment to the Poole grinding machine, not mentioned by Mr. Rose, is a friction device to resist the free action of the swinging carriage. When first starting this friction is put on, and each wheel acts like a single wheel machine. If the roll is not allowed to heat and become crooked from that cause, when the emery wheels cut all around, the axis of the roll, will be straight regardless of the ways, as is the case with all grinding machines, but if the ways are crooked the roll will be smaller in some places than others, and it is the subsequent securing of absolute parallelism that the J. Morton Poole system reaches, and I doubt if ithas yet been reached independent of this operation, or in any other way. Whether the two wheels ought not to dance about and do bad work, as Mr. Smith suggests, I do not know, but that they do not do it the work itself shows.

The emery wheels are belted and driven as Mr. Rose has shown, two belts to each wheel 3 inches wide. The wheels are 1¼ inch face, run with ¾ inch traverse.

It may be well for Mr. Rose to have his article revised before putting it in his book, but I should certainly recommend that the revision be made by the successors of J. Morton Poole rather than by one who very likely never saw the machine at work.

J. G. TRAMIS.

Churning A Mould.

Editor American Machinist:

A short time since you published an article in which the writer described a method of pouring or gating work that would insure sound castings and shrinkheads, churning, as has been the time-honored custom, being dispensed with, and no fear existing of shrinkholes or porosity of iron in the castings. Without any attempt to discuss that phase of how to prevent unsound castings, it is a curious fact that very few moulders know how to churn a casting that needs to be sound in a manner that will get it sound. The average moulder, when he has a piece to churn, will invariably have the riser head so low that when his mould is full, and runner also (in most cases), the riser to be churned will be full to the top. He will then begin a search for a rod to churn with, and will find a discarded one that resembles a good nice carrot in shape, as cold as an icicle, and plunge it into the riser (if it is not frozen out), to imminent danger of his own eyes and the eyes of those looking on; and, by the way, there is a peculiar fascination among the men in a foundry to see a churning rod inserted in a riser. Did any one ever see a rod inserted without two or three on-lookers They will gather around the sacred riser shrine, like unto the Major and Judge in the "Arkansas Traveler."

The rod is thrust into the riser, and is pulled out with half the metal adhering to it. The moulder calls for "more iron;" a cold ladle is caught up by the new apprentice boy, and he gets about 2 lbs. in the ladle, and it is thick as mud when he gets it where it is wanted; he fills it to the top over a crane ladle that is under the spout, and he tries, but fails, to lift it out, and has to be helped. At last he gets to the flask, and then finds that the moulder has so placed the weights that the ladle has to be held two feet away from the riser, and in attempting to get it poured there is great difficulty. The riser is finally replenished to overflowing, and down comes the plunger rod, and out goes the liquid iron around the edges of riser. After repeating this two or three times, "she bungs up," as the boys say, and the enlarged carrot-shaped churning rod, the size of a turnip now, is thrown into the usual receptacle for such things in a foundry, to be again hunted for by the next.

It is found out in the morning that under the riser, after breaking it off, it is not sound; in fact, you can run your finger in the cavity and yet it was churned, and that same moulder will claim that he understands how to churn a piece of casting, and don't you forget it.

To churn or feed up the shrink in castings is a very nice job, and to be able to do it, and do it well, requires the best of judgment and care a moulder can give it. A few rules might not be out of place. First—Never have the pouring basin higher or as high as riser by 2″ or 3″; this depends on the thickness of piece to be churned. Second—Clean off churning rod before getting your iron, and heat up the rod greater in length than depth in riser it will be entered. Third—After pouring casting, put on soft sand over vents, then insert rod down to the depth wanted, and work the rod up and down slowly always keeping to the outside and around the outer walls of your riser. Fourth—Wait until your riser shows that the liquid iron has settled 2″ sure before getting more iron; then get hot right from the spout. Put in the hot iron, with the rod inserted in the riser; this will heat up the iron that has clung to it. Have a hammer handy, and knock it off while hot. Do not put in more than one inch above first level when mould is full; now ply the rod hard against the wall of the riser, and so repeat until you feel the grain beginning to be formed below in the casting. When it seems as if you were putting the rod into a bag of peas, churning can cease, with the extreme satisfaction that you have done all that mortal could do, and the writer believes done it well.

It sometimes happens that the riser will fill up to the top and the hole grow small; in that case, make an extra length to riser head in an iron ring, put it on and then get a fresh supply of hot iron, and fill in one inch above the crust, and it will soon yield to the persuasion of a good, hot, clean rod in the hands of the fellow that means it.

FOUNDRYMAN.

Making Pattern for Spiral Grooved Drum.

Editor American Machinist:

Being a fellow-craft of Mr. F. W. Barrows I take special notice of his writings on pattern making. If you will allow me I will present a few of my ideas about patterns for screws. A drum, for instance, similar to that of Mr. Barrows' description for winding a chain I make without coring spiral groove. The sketch, Fig. 1, will explain itself; it represents a drum 28″ diameter × 36″ long, spiral groove 1″×1″×3″ pitch. This pattern is made of octagon staves Nos. 1, 2, 3, 4, Fig. 1, fitted to the outside, secured from inside by screws. If the spiral is of a coarser pitch or the diameter of drum smaller, the groove deeper or nearly square, a larger number of divisions must be made to avoid back draft.

Fig. 1 represents one-half of pattern with sectional view; Fig. 2 is the groove half size.

After this pattern is rammed up, the screws which hold the staves to the body of pattern are removed by the molder, who is then able to extract the pattern. The side staves, No. 1 and 4, are then drawn, and last the lower ones. This system will insure a good casting if the pattern is properly made, where in coring spiral grooves we have serious difficulties to deal with. First, there are a good many cores to make; next to set these cores and join them so it won't leave a mark wherever they meet, the venting of them, and last of all, when all this is accomplished, what will keep these cores from dropping out of the cope by closing up the mould?

GEORGE ALLGE,
Pattern-maker at Colts Armory,
Hartford, Conn.

Applying Blue Print Solution.

Editor American Machinist:

Numerous articles on the subject of blue prints have appeared from time to time in the AMERICAN MACHINIST. Nearly all contain this phrase, "Apply with a brush." Experiments with different styles of brushes and methods of brushing have convinced me that the uneven coating is not due so much to the instrument of application as the surface on which the paper rests. The following method may be of some benefit to your readers: Take a piece of glass a little larger than the sheet to be coated; fasten the same to it by means of spring clamps or spring clothes pins on three corners, the fourth being held by means of a paper weight, or, better, by the finger, while the sheet is being coated; the solution should be applied by means of a pad made of cotton wadding and in circular strokes. By this method I have obtained better results than by any other tried. In the sketch *a* is the sheet of paper; *b b b*, glass plate; *c c c*, spring clothes pins; and *D*, paper weight.

CHAS. W. THOMAS.

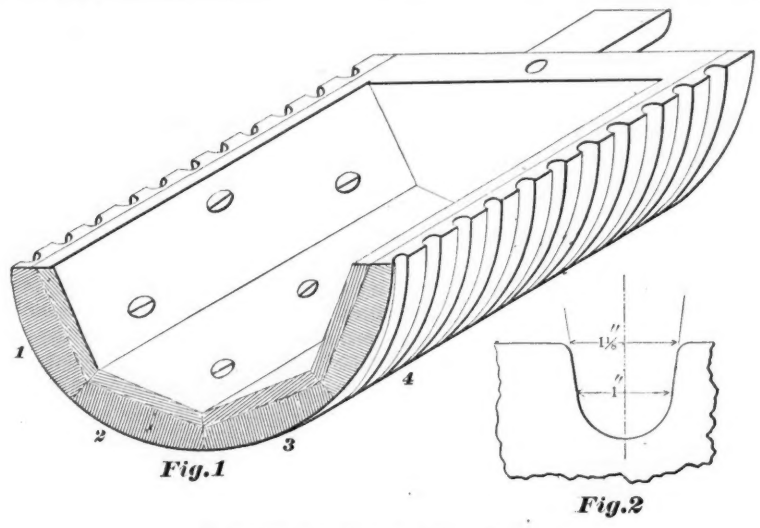
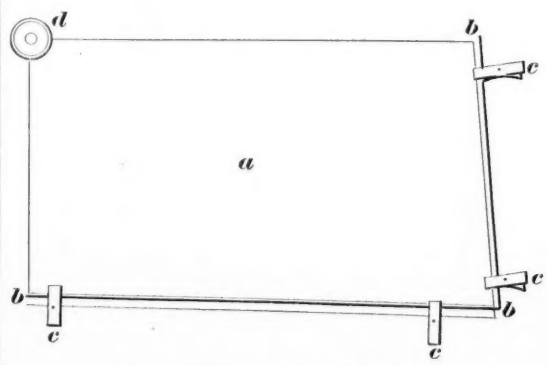


Fig. 1 Fig. 2

PATTERN FOR SPIRAL GROOVED DRUM.



APPLYING BLUE PRINT SOLUTION.

Lathe Dog.

Editor American Machinist:

The enclosed sketch represents a lathe dog which I made, and find a very convenient tool. As you will see, the screws have ball-heads, and one of the clamps has the holes drilled large and correspondingly balled. It will fit any taper and quite a number of odd shapes; it will not twist on taper works like a "common dog." I think any machinist or toolmaker who tries it will find it better than it looks.

S. H. DYER.

Pawtucket, R. I.

Chips from Here and There.

BY JAMES F. HOBART.

The ordinary anvil block consists of a section of hard-wood log, set end upon the floor. Four iron pins are driven into the block for holding the anvil in place thereon.

The smith often drives staples into the block for the purpose of holding center punches, deadhead and other small tools. Much of the smith's time is also spent in picking up chalk, callipers, cold chisels, or other tools which have been laid on top of block beside the anvil, and which keep continually falling to the floor.

A little trouble would save much time on the smith's part in this respect. Square the block just below the anvil, and case around the foot of anvil, scribing the casing to fit tightly around the anvil.

The top of the casing may be made to form a shelf of any desired width, but about four or five inches will give satisfaction.

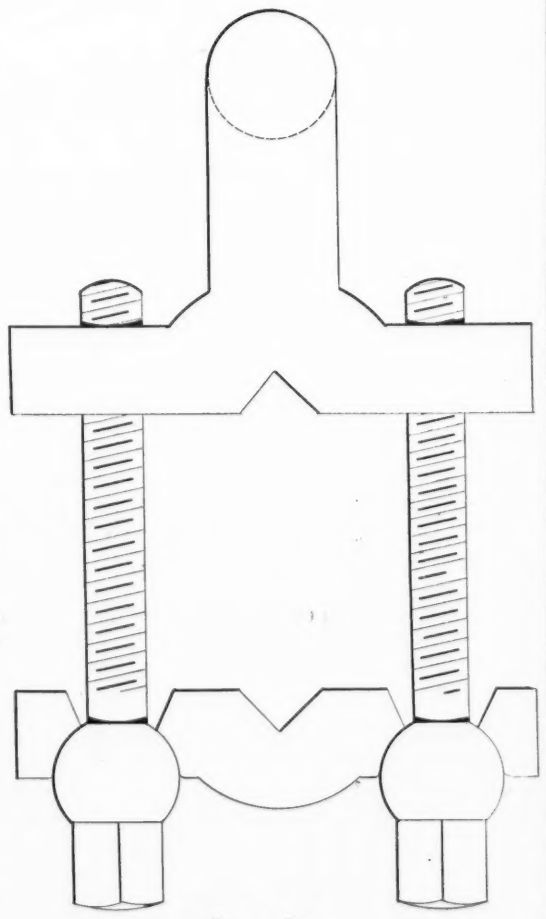
This shelf is a first-rate place to lay tools upon, and being in a measure free from most of the jar transmitted to the block by blows on the anvil, the tools are not as apt to fall to the ground during heavy striking.

In the absence of a suitable block, a box filled with sand forms a good support for the anvil. In this case the box should be made very strong to prevent its spreading apart as the sand becomes packed tightly into it, by continual pounding. A large piece of plank may be placed between sand and the anvil, but it is not indispensable. The top of the box may be cased and scribed up to the anvil, making a neat, tasty job.

Probably sand will need to be added to the box once or twice during the first year or two, but after that time the sand under the anvil will settle but very little.

The "simplicity of things" is apt to bother the machinist and the designer much more than the complex quantities with which he has to deal.

In building a wood-working machine, it was necessary to attach a weight to a lever in such a manner that it could slide from place to place, and even be readily removed from the bar without the possibility of its falling upon the hands of the operator.



LATHE DOG.

Over this problem the draftsman, the foreman and the "owner" spent much thought. "Put on a bracket carrying a wire cage, which will catch the ball should it fall," suggested one. "Place an adjustable stop at end of lever." "Put a set-screw in the weight," were other plans advocated; but one day a "cub" attached a short chain to ball and part of machine, in such position that the ball could not reach the table, even if dislodged from the lever.

The faculty of this shop felt the immediate need of "refreshments" upon beholding the boy's solution of the problem. Hundreds of other difficulties would be more quickly overcome if we were not in the habit of looking too far for the remedy. We think a seeming complicated case needs an elaborate mechanical device for its relief when a kink of less than "Jeffersonian simplicity" is all that is needed. The inventor who piles the complicated mechanical movements upon his creation is the inventor who talks the loudest about his monstrosity, but the quiet man who does the same work with but a hundredth part of the machinery—this man is the true inventor, and the man who makes the most dollars.

The number of tools around the average engine-room is very limited, but such tools as are supposed to be kept therein are not always available.

Accidents seldom give warning of their approach, but the prompt use of a few tools by an intelligent man will either avert them altogether or do much to lessen the damage.

In a great many engine-rooms wrenches, hammers, cold chisels and other necessary tools are nowhere to be found when wanted in a hurry.

Go into any U. S. engine-room, either in boat, building or lighthouse, and there you will see the tool-board affixed to the wall, with clean, bright tools kept thereon by pins, hooks and wooden or brass buttons.

A well-kept tool-board of this kind always proves an attractive ornament to the engine-room, and the board can be made to conform to means of the owner, or, when that method of obtaining it fails, it is not beyond the engineer's private means. From a hundred dollars' worth of mahogany and brass, to one dollar's worth of pine and paint, is the range of a tool-board, and one will keep the tools as well as the other.

After a half hour's hunt for that alligator wrench, just make a tool-board, put it up in your engine-room, and then keep your tools on the board.

The London *Ironmonger* tells why the Morrison tariff bill was defeated as follows:

The reason why the Morrison Bill was defeated so promptly has been discussed with much interest in Washington ever since that event. The fact is the Bill was defeated because the people of the Northern Atlantic States cared nothing about it, took no interest in its fate, refused in any effective way to tell its Congressmen to vote for it, and, in fact, from April 12—the day it was reported to the House—to June 17, gave it a persistent cold shoulder. Without the help of these Northern Atlantic States the Bill had not votes enough; therefore it failed. It was refused consideration by 17 votes, the yeas being 140 and the nays 157. Of the 157 who voted against it 36 were Democrats. Of these 36, 19 were from the Northern Atlantic States. Some of Mr. Morrison's friends have denounced the Democrats who voted against it as false to their constituents. But the fact is their constituents cared nothing about the Bill, else why did they not speak out? Ten New York Democrats and seventeen New York Republicans, for instance, voted against the Bill. They would have voted for it, party or no party, if their constituents had required them to; there is not the least doubt about that. Members of Congress in the present condition of parties, and with gen ally small majorities, are only too ready vote as ther constituents tell them. The ent New England delegation, barring four Dem crats who adhered to Mr. Morrison, voted against the Bill. If their constituents had demanded it they would have voted for it. The same is true of New Jersey, the whole of whose delegation—four Republicans and three Democrats—voted against the Bill; and Pennsylvania, where twenty-five out of twenty-eight, constituting the delegation, voted against the Bill. These facts are significant, and seem to fully warrant the general conclusion that the drift of public

opinion on tariff questions is not as marked as the interests involved would lead one to expect.

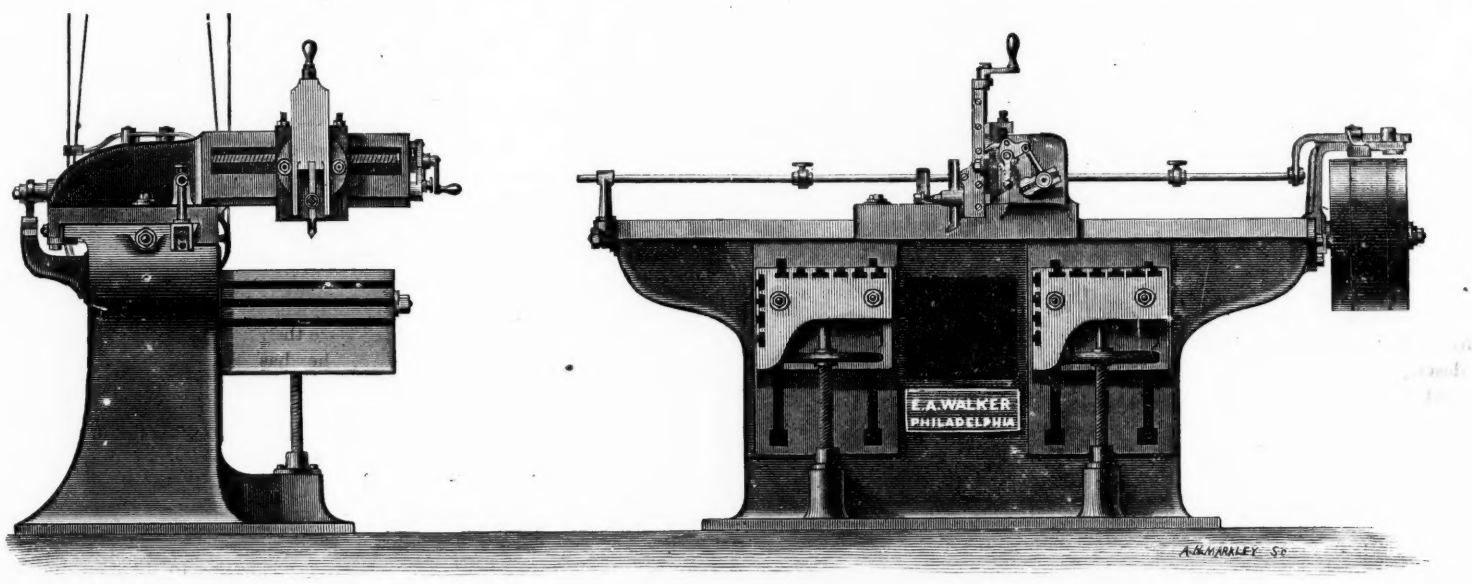
The *Ironmonger* prints Bill with a capital letter, which is right for that side of the water. If it had become a law it would have been a capital measure for Britain. So long as Congressmen preserve the habit, so distasteful to our English friends, of voting on tariff matters according to the wishes of their constituents the protective policy will be preserved.

16-Inch Combined Planing and Shaping Machine.

The cut represents side and end view of this machine.

This size is made to plane from three to four feet in length, and furnished with an extra bed between the tables, also countershaft, wrenches, etc. The saddle and tool supports are moved upon the bed as in the other sizes of this combination, but the design of frame and arrangement of tables are for a class of work rather lighter and less extended than is capable of being done on the heavier and more expensive machines.

The movable plates are dispensed with, and the square, slotted tables are attached directly to the bed, having a vertical adjustment only. This arrangement admits of a rigid frame and support for the tables, and the machine is therefore well adapted for any work that does not require all the space above the floor, or an excavation below it for pit work. It may



COMBINEL PLANER AND SHAPER.

be used in cutting racks and bars of metal, keyways in shafts, pulleys, gears, etc., in fact, for all such work within its range, the open side admitting work that would require a larger and more costly machine.

Advantages claimed for this machine are:

Pieces may be fastened in vise or clamped to one of the tables while the tool is cutting and finishing work already set upon the other table, saving time when a number of like pieces are to be planed, the cutting tool being quickly traversed from one piece of work to the other. As the saddle or carriage does not overrun the guides, the support of cutting head and tool is constant throughout the stroke, combining the accurate movement and range of the planer with the conveniences for adjustment usually found on the shaper.

Manufactured by E. A. Walker, No. 75 Laurel st., Philadelphia.

The inventing of rotary engines is not very brisk this warm season, only two patents appearing in the *Official Gazette* of July 20th. New car couplers, however, do not lag, patents for five having been granted July 20th. Patents for two churns figure in the same issue of the *Gazette* one for "artificially enriched cheese" and one for a combination tool.

The assertion that "brass cannot be tempered" is met by a writer in *Mechanical Progress* with the following reply: "This differs with my daily experience. Brass, not hard by mixture but by compression, either rolling, hammering, wire-drawing, or any other process which compresses the particles of metal, can be and is tempered regularly, just as easily and in the same manner as you would temper an equal sized piece of hardened steel, viz., by heat. By placing a small piece of polished steel on the brass object to be tempered and applying the heat so as to effect equally the brass and steel, you will know by the color of the steel the temper of the brass, which by this process may be tempered in exact proportion to every shade of color of the steel."

The semi-annual statistical statement of the American Iron and Steel Association shows that our production of pig iron in the first six months of 1886 amounted to 2,954,209 tons of 2,000 pounds, or 2,637,687 tons of 2,240 pounds. The country has never before produced as much pig iron in the same time. Prior to 1879 it never produced as much pig iron in a whole year, and the production of 1879 was only 116,666 net tons greater than that of the first half of this year. The greatest absolute gain in production in the first half of 1886 as compared with the last half of 1885 was made by Pennsylvania, but among the States which are prominent in the production of pig iron, the greatest relative gain was made by Ohio and Alabama, each of which greatly increased its production. The stocks of pig iron on hand and unsold in the hands of makers or their agents at the close of the first half of 1886 amounted to 470,421 net tons, which was a slight increase on the quantity held in stock at the beginning of the year, namely, 416,512 tons.

Our production of Bessemer steel ingots in the first half of 1886 amounted to 1,073,663 net tons, against 938,418 tons in the second half of 1885, and 763,344 tons in the first half of 1885. Our production of Bessemer steel rails in the same period amounted to 707,447 net tons, against 622,161 tons in the second half of 1885, and 453,446 tons in the first half of 1885. Our production of open-hearth steel rails was only nominal, amounting to 852 net tons. This country, the report concludes, will make more Bessemer steel, Bessemer steel rails, and more open-hearth steel in 1886 than in any previous year.

A dispatch from Columbia, S. C., July 23, says:

"The boiler in the water works exploded this afternoon, killing the colored fireman and fatally wounding another colored man and seriously injuring five others, among them the superintendent of the works and Alderman W. B. Lowrance, who was struck in the back by a piece of the boiler. The boiler went to the bottom of the river during the May freshet and had been resuscitated, this afternoon, being the first time it was used since then."

There is not much room for winding a mystery around this explosion, A boiler becomes corroded by lying on the river bottom and is again put to use without a careful inspection to determine its condition. Such melancholy occurrences ought to convey a warning to careless steam users, but it is difficult to see it if they do. Boilers like the one at Columbia go right on exploding and killing people, only the last one being remembered.

The Rev. J. H. Judson, a Presbyterian missionary in China, writes us that he is in need of help in a school he has established. What he wants is some one to take charge of the industrial department, especially in work in the metals. He wants some one who is thoroughly competent in both theory and practice. His address is Rev. J. H. Judson, Shanghai, China. He invites correspondence.

Apprenticeship at Trump Bros.' Machine Company.

The publication of communications by the AMERICAN MACHINIST from first-class establishments which have some form of apprenticeship, demonstrates that there are more regular apprentices taken, at least at the machinist's trade, than is generally believed.

The following is from the "Rules and Regulations" of Trump Bros. Machine Company, Wilmington, Del.:

Rule 1st. Applicants for apprenticeship should not be over 17 years old. Those employed will be given such work to do as the foreman of the shops may select.

Rule 2d. After three months' trial, should the capacity to learn and conduct of the employe prove satisfactory, the Indenture binding the minor to serve as apprentice until twenty-one years old, must be signed by his father or other guardian.

Rule 3d. Trump Bros. Machine Company reserve the right to discharge an apprentice at any time for indolence, bad conduct or absence from his duties without permission, and also to charge against his weekly pay, or the reserve fund provided for in indenture, the cost of work spoiled by him through willful neglect or inattention. (The superintendent of the works shall be the sole judge in cases coming under this rule.)

A regular form of indenture is used, which binds the apprentice to serve until he is 21 years of age. In this is the following:

Trump Bros. Machine Company agree to instruct said apprentice in the trade of a machinist, as practiced in their shops, as fully as practicable, the foreman of the shops designating his work, and advancing him as the work in hand and the aptitude and ability of said apprentice may warrant, treating him fairly.

The compensation to the said..... will be, for the first year of his apprenticeship, at the rate of $3 for each week of 60 hours' actual working time; for the second year, $4 per week; for the third year, $5 per week; and for the remainder of his time of apprenticeship, $6 per week. Trump Bros. Machine Company will retain and set aside from said compensation the sum of $1 per week for each week worked by said apprentice, making monthly deposits of such amount in the Wilmington Savings' Fund Society, or other savings institution of this city.

The amount so retained and deposited, together with interest allowed thereon by the institution in which it is deposited, constituting a fund which, should the said apprentice be disabled by sickness or accident, or this indenture be canceled by said company, or should the apprentice satisfactorily perform his duties until of age, shall be paid to said .....or his legal representative; on the contrary, should the said.....be discharged from service for cause or causes enumerated in Rule 3d, or should he enter on other service without written consent of said Trump Bros. Machine Company, the fund above provided for is to revert to the use of said company as part compensation for the loss of service of said apprentice.

Should the exigencies of business require said apprentice to work between 6 P. M. and 7 A. M., allowance will be made for the time actually worked at the usual rate of compensation.

The *Railway Age* says: "The demand for railway cars is now very heavy, and most of the car builders are full of orders. Nearly every road in the country is adding to its equipment, and the requirements for new lines alone are very large. The New York Central recently placed an order for 59 drawing-room and sleeping cars, the largest single contract for sleepers ever given. Prices are low, and purchasers now have the advantage. At the same time, manufacturers do not work for nothing, and there is little loss from bad debts, orders being filled more strictly on a cash basis than ever before."

We had a call one day last week from John Buncle, proprietor of the Parkside Iron Works, Melbourne, Australia. He is the largest manufacturer of agricultural, tobacco and tanners' machinery in the Colony of Victoria. About 150 men are employed at his works. Mr. Buncle went from England to Australia in 1852, and this is his first visit to the United States. He regrets not having visited this country years ago, as the saving in labor by the use of American automatic machinery would have saved him thousands of dollars a year. Some of Mr. Buncle's machines have been copied in England, notably a feed cutter. The English copyist advertised it as "after the same design as John Buncle's, of Melbourne." Mr. Buncle informs us that for twenty years eight hours has constituted a working day in Australia. He intended to spend but three weeks in this country, and has already been here over two months.

Patent brokers are becoming quite numerous. They send a very enticing circular to parties who take out patents. One sent out by a so-called "banker and broker" in this city has the following paragraph: "For selling patents, securing the manufacture on royalty or selling interests in patents, my terms are $25 in advance where the valuation is less than $15,000, and $50 in advance where the valuation is more than $15,000, and 15 per cent. on the amount realized from sale or royalty." He probably picks up enough advance fees to make the business pay.

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NEW YORK, AUGUST 14, 1886.

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Improving Business.

Evidences of a better and more prosperous industrial situation may be found in various quarters but some parties have become so used to croaking about dull trade and hard times that they find it difficult to change their tone. Thus far this year the failures have been fifty per cent. less in amount than for the same peried last year. Labor troubles have spent their force and are likely to be much lighter for some time to come. Advances of wages are much more frequent than reductions. Most of the latter are chronicled by the daily press, but only a small part of the former. Railroad earnings are increasing over last year, and there is more activity in building new road and improving equipments. There is more of a tendency to erect new railroad repair shops and enlarge old ones than for some years previous. More iron furnaces than usual at this season are getting ready to go into blast. New industrial enterprises of various kinds are quite active in forming, and all require machinery or supplies of some kind. The stock of printing cloths is smaller than at any other time for five years. The rule seems to be not to accumulate much stock in any industry. Crops, as a whole, in spite of drouths, promise well. Congress has not disturbed the protective tariff, and there has been no radical legislation of any kind to interfere with general business. If the present Congress has done nothing to help business, it has the merit of doing nothing striking to hinder it.

Many industrial establishments are running with fuller force and more orders on hand than for years previous, but are chary about having the facts publicly known.

If we have a business boom next fall it will not surprise some far-sighted men who have been watching the course of events.

A Bargain Corner for Machinery.

In large dry goods and notion stores there is usually a "bargain counter" loaded with goods partly out of fashion, shop worn articles, and goods generally that are unsalable in the regular way. Mixed with these are a number of small salable articles offered at lower than regular prices to draw custom to the more costly articles. There is always a rush of ladies to the bargain counter, each bent upon buying something very cheap. Most of them think they succeed in doing so.

This is a feature worth copying by some machinery stores. Let them have a bargain corner and fill it with tools and machinery that have been superseded by better designs and second hand machinery fitted up to look like new, with a fair sprinkling of new files, taps, wrenches and other good tools in regular demand offered at lower than known market prices. The bargain corner might be made a prominent attraction of any large machinery store. Everything should have the price marked upon it in plain figures. Thus an obsolete style of engine lathe might be labeled, "$200 reduced from $375," a light frame iron planer "$250 reduced from $500," and so with other tools. There are always people that will study and scheme to get something for less than it is worth, taking every advantage of real or supposed necessities of the seller, and there is not much mourning among their neighbors when they "get stuck" on a purchase.

One of our English readers, in sending us a renewal of his subscription the other day, enclosed, evidently by mistake, his "inland revenue license" permitting him to keep a carriage, instead of the money order which he undoubtedly meant to send us. The license cost fifteen shillings (about $3.65), while the subscription only figures up fourteen shillings seven pence, or $3.50 in United States currency. We note this difference for the purpose of enabling those among our English readers who ride in their carriages to make a comparison between the cost of their locomotive and their intellectual comforts. We have returned our subscriber's license, fearing that negligence on our part may subject him to insolence at the hands of some prying "bobby," when next he rides abroad.

Machinery for Aluminium.

The American Aluminium Company have been organized at Detroit, with a capital stock of $2,500,000, the machinery being valued at $3,000, and the patents of Dr. Smith for the United States, Great Britain and France for a process for the manufacture of aluminium at $2,497,000.

The most remarkable feature about this company is the astonishingly large investment in machinery. This may be the common plan of organizing great companies in Detroit, but not here. New York companies with two or three million dollars capital are as common as the flowers that bloom in the spring, but such lavish investments in machinery at the very start have nothing to do with the case, as any Detroiter may satisfy himself by inquiry. During the past six or seven years several large (on paper) aluminium companies have been formed, and we were told what an immense production they expected to show. As we remember the highest production of aluminium in this country was ascertained by the bureau connected with Interior Department at Washington to be about 150 pounds in a single year.

The wonder is what will the new company do with so much machinery?

Since the new law requiring corporations to pay weekly went into effect in Massachusetts there have been complaints of its being hindersome in some places. On one railroad the employes requested their pay to be held for a month. A large cotton mill in Lowell tried paying by checks, but it caused a great deal of trouble. About half of their 800 employes took a day off to get checks cashed, and the bank was overcrowded to the detriment of other business. Some objected to having their earnings known to those receiving the checks, and a few tradesmen refused to cash them. The check system will be likely to be abandoned.

Electric Motors.

A great many machinist's apprentices have been in their day, the proud builders of toy steam engines that would "turn over" under steam. Their felicity upon these occasions seems to be fully equalled by that of grown up boys who witness the performance of a new electric motor. Philadelphia papers are jubilant over an electric motor for cars, recently given an alleged trial in that city. It was pronounced a "thorough success" by a large number of "scientists and other distinguished gentlemen," after its ability to move at "nearly eight miles an hour and stop and reverse," had been demonstrated.

Seriously, anyone who doubted the ability of an electric motor to do these things must either have a poor opinion of the ability of the inventor, or be a fool. At this time the only thing doubted is the practicability of such a motor to do the work required of it. People would have much much more confidence in the ultimate success of any invention in this line if the inventor went quietly on his way demonstrating this important point instead of wasting time in showing the curious that it would "turn over" and "reverse." A number of electric motors have reached this stage during the past five years, and their value seems to be in inverse ratio to the energy displayed in showing them up as playthings.

Our Navy in Prospective.

The conclusion of Secretary Whitney to duplicate a recent production of Armstrong & Co. of a war ship having uncommon speed, is probably a wise one. The working drawings will be purchased and—it is to be hoped—followed in the construction. While in this country we have been doing nothing for twenty years in building war vessels, the ship builders of Britain have been making progress, and it is foolish to assume that they have not learned many things of which we are ignorant.

An individual who starts out with the idea that he will learn everything by his own experience is, to say the least, foolish. The same reasoning will apply to the Government in this case. The other vessels to be built from the specifications of the American Bureau of Construction will furnish all the means of comparison desirable at present.

Every indication at present leads to the belief that this country has now fully begun the construction of a navy in sober earnest, and that we shall soon be engaged in building the heaviest of modern guns, for defence, we trust, rather than other warlike purposes.

Cranes are used much more in England than in this country, and they are great savers of labor and expense. A dock crane at Hull was recently tested with a load of 103 tons. It raised 65 tons at the rate of six feet and six inches a minute, and made a complete revolution, the load passing through a distance of 383 feet in six minutes and fifty seconds. All the valves and levers are within reach of one attendant.

English steel rails are being imported for the Texas Pacific Railroad, which is in the hands of receivers appointed by the U. S. courts. After paying $17 a ton duty, it is claimed that they cost 50c. to $1 a ton less than American rails. There is a great deal of suggestiveness in this. The tariff on steel rails has been about the most formidable bugaboo the "revenue reformers" have set up. Perhaps, if it were cut down one-half, all steel rails would be imported and all rail mills in this country would close up.

The female employes in a factory in Burnley, England, are forbidden to wear their hair "banged." This is to prevent them being caught by the hair in shafting. The proper precaution would be to place shafting where it could not catch the hair of girls anywhere about the floor or stairways.

The magnitude of the dairy interest is large, but often over-estimated, and the possessor of every cow, hog or sheep is interested in the manufacture of butter substitutes, to say nothing of the consumers, while many owners of cows do not produce butter. Besides, large quantities of imitation butter are exported, and the business of its manufacture is legitimate beyond successful controversy.—*Bradstreet's.*

It has remained for the advocates of bogus butter to discover that the dairy interest is over-estimated. The oily mixture made from the fat of cows, hogs, sheep and other animals, and sold in the market for butter, is a fraud of the most flagrant kind. It does not help the case by calling attention to the fact that a large part of the bogus stuff is sold to our neighbors in other countries.

A paymaster in the United States Navy, found guilty of stealing $80,000, and of nearly every other crime named in the regulations, was recently sentenced to three years' imprisonment on half pay. Lucky he wasn't some poor fellow who had stolen a loaf of bread.

Professor Patterson, of San Francisco, only lacks one insignificant requisite to enable him to make his contemplated balloon voyage from San Francisco to New York in two days. That requisite is the money necessary to pay for constructing the required propelling machinery. San Francisco is not a good place for such schemes. Let the professor come to New York and start a ten-million company, and the necessary means will be forthcoming.

We are pleased to note that the plan of furnishing workmen with hot coffee at noon, which we advocated in a recent issue, is making headway. D. A. Hopkins, who manufactures lead-lined self-fitting journal bearings, is about to erect a new foundry in Jersey City nearly a hundred feet square, which will contain a comfortable room where every employe will be furnished free with hot coffee at noon. We hope to see this plan, or something like it, widely adopted.

The *Mechanical World* is of the opinion that the English standard wire gauge will be in universal use in the United States in a few years. Our opinion is that in this country wire will be measured by our excellent micrometer calipers, dispensing entirely with so-called wire gauges.

The petroleum producers of the country have now all the opportunities necessary for testing their ability to compete for foreign trade. According to the burden of testimony the advantages, so far as quality and cost of refining, are enormously with them as compared with Russian competitors. Against this is Russian cheap labor, and Russian determination to control European markets if possible. The contest will be an interesting and instructive one.

Literary Notes.

SANITARY SUGGESTIONS; OR, THE HOUSEHOLDER'S Vade Mecum. By Sampson Low, Jr., B.A., Cantab., etc. Published by Sampson Low, Marston, Searle & Rivington, Crown Buildings, 188 Fleet street, London.

This book will undoubtedly be found to contain information of value to the householder, to whom it is particularly addressed. Anything in this line that shall give general information on the subject named in the title is of undoubted interest.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(293) G. P., Torrington, Conn., will find instructions for measuring pitch of screw propeller in AMERICAN MACHINIST of June 28, 1884.

(294) F. H. M., Waterbury, Conn., asks: Is a blank for worm turned 3⅛ inches diameter at the throat right for 42 teeth, the worm being 4 threads to the inch? *A.*—42 teeth, 4 to the circular inch, calls for circumference of 42÷4=10½ inches, and a diameter of 10.5÷3.1416=3.34 inches throat diameter of blank.

(295) J. M., ——— Ind., writes: I have got a job to dress the teeth of a large spur wheel 1¼ inch circular pitch. How must I proceed to lay off the teeth? *A.*—The only way you can expect to be able to lay out the teeth of gears is to study up the subject. You will find a variety of books treating of this, to one of which we must refer you for the information you seek.

(296) G. L. P., Galveston, Tex., writes: We have four boilers 40″ diameter, 26 feet long, with two flues in each boiler; the boilers are supported at each end, and under mud drum, which is six feet from after end of boilers. The boilers have two steam drums 40 inches diameter, 17 feet long, with cross drum 15 inches diameter and 13 feet long. The mud drum is 24 inches diameter, 22 feet long. The mud drum is 5-16 inch iron, boilers ¼ inch. Boilers have been thoroughly examined, and are in good condition. The proprietors insist upon a hydrostatic test. I have protested against this, on the ground that the great weight of water will be liable to strain the boilers. What is your opinion of this? *A.*—We should object to such a load of water without a center support for the boilers; in fact, we should object to using the boilers without such a support.

(297) I. K., Elliott, N. Y., asks: 1. What is the best way to temper a machinist's hammer? *A.*—We have always found a very satisfactory way to be to heat and harden the hammer, then draw the temper by means of hot irons in the eye. 2. Should lathe and planer tools be tempered the same for steel, cast iron and brass? *A.*—Tools for cutting metal should be left as hard as they will stand without breaking. This will depend upon the quality of the steel and the shape of the tool. Tools for brass usually have an obtuse cutting angle, and can generally be left a little harder than for iron. Very frequently the shape of a tool for cast iron is such that it may be left very hard without danger of breaking. There is no rule but that of experience. 3. Is there any rule for setting tail-block to turn taper? *A.*—See Questions and Answers in AMERICAN MACHINIST of Dec. 8, 1883. 4. How is a double-threaded screw cut and measured, and what pitches are used? *A.*—Double-threaded screws are usually cut by first cutting one thread and then dividing the blank space and cutting the other. The pitch will measure right before the second thread is cut, or by skipping one thread in measuring after both threads are cut. Double threads are cut with all kinds of pitches.

(298) Andy, Luday's Island, S. C., writes: I am in some trouble about an engine I am running. It is a 16″×24″ plain slide valve engine. The trouble is, we put in a condenser, and since then the engine pounds almost enough to tear itself to pieces. The valve had ¼″ lead, but I changed it to 1-32″ without remedying the matter. What can I do to remedy the matter? *A.*—The probability is that your engine is not well enough constructed to stand the condenser satisfactorily. You may improve the running by adding inside lap, or possibly by drilling holes through the lip so it will take a little steam directly after the exhaust closes. 2. In the cabin of our washer boat we are troubled with roaches. What will exterminate them? *A.*—Thorough washing and cleansing, and a liberal scattering around of powdered borax is said to be effective. 3. Please give me the proportions of alcohol and pyroligneous acid for etching on steel? *A.*—1 part (by measure) of alcohol, 4 parts of pyroligneous acid. Mix them together and add 1 part double aqua fortis.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Patent Att'y, H. W. T. Jenner, Washington, D. C.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 169 William st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Tack, Wire and Shoe Nail Machinery. Wm. A. Sweetser, Brockton, Mass.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Improved Labor-saving Upright Drills, 20-in. to 36-in., inclusive. Currier & Snyder, Worcester, Mass.

Veneer machines, with latest improvements, Farrel F'dy & Mach. Co., Ansonia, Ct. Send for circular.

Curtis Pressure Regulators, Curtis Return Trap. Curtis Damper Regulator. See July 24, p. 14. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

"Hints to Steam Users, Engineers and Firemen." A 100-page book on care of steam boilers; just issued; containing useful rules, tables, etc; a valuable book for engineers; sent on receipt of 25 cts. in stamps. J. N. Mills Pub. Co., 30 Vesey st., N. Y.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Wanted—Numbers 1, 2 and 4 of volume IV., 1881; must be in excellent condition for binding, if soiled we cannot use them; for copies described as above we will pay 25c. each, and prefer to have the whole three if possible. Parties favoring us will kindly write name and address on wrapper. AM. MACHINIST Publishing Co., 96 Fulton street, N. Y.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2, post-paid. Published by John Wiley & Sons, 15 Astor Place, New York.

Manufactures

Adam Weber, of Vineland, N. J., will build a brass foundry.

Snow & Bassett, Franklin, Mass., will erect a large straw-goods factory.

The Moline Malleable Iron Works, of Moline, Ill., are erecting a brick addition.

The Ogden Engine Co., of Chicago, are bringing out new designs in machinery.

Lewis Blount, Durham, N. C., expects to build a new machine shop and foundry.

The Conyers Oil & Fertilizer Co. are building a cotton-seed oil mill at Conyers, Ga.

Lark Metchin, Bear, Ark., contemplates enlarging his machine shop and foundry.

The Greenup Stove Co., Greenup, Ky., has been organized, and will build a foundry.

C. B. Bailey, of Mansfield, Pa., has purchased a foundry, and will add new machinery.

It is reported that the Southern Central Railroad will build repair shops at Auburn, N. Y.

The Penn Bridge Works Beaver Falls, Pa., are building a large addition to their works.

It is reported that George Sicklesteel will start a fanning mill factory at North Branch, Mich.

W. D. Sprague & Co., Old Fort, N. C., contemplate moving their machine shops to Marion.

The New Castle Wire Nail Works, New Castle Pa., are erecting two large brick buildings.

Patterson & Hill, Cleveland, O., are building a foundry on Hoadley street, north of St. Clair.

R. Morral, 23 Smallman street, Pittsburgh, Pa., contemplates starting boiler works at Salem, N. C.

The Jarecki Manufacturing Company, of Erie, Pa., have broken ground for a large new foundry building.

The Marietta Paper Manufacturing Company, Marietta, Ga., is building a new mill 75×220, two stories high.

The Richmond & Danville Railroad Co., it is reported, have purchased ground in Asheville, N. C., for machine shop.

The Louisiana, Arkansas & Ft. Scott Railroad will build repair shops at Natchez, Miss., for their southern division.

The Arnold Print Works, North Adams, Mass., expect to build a cotton mill to be operated in connection with the print works.

A. B. Crum, Maysville, Ky., is trying to organize a $100,000 company to purchase plow works in that city, advertised for sale.

It is reported that the St. Louis, Arkansas & Texas Pacific Railroad will build a roundhouse and machine shops at Sherman, Tex.

Part of the machinery has been purchased for the new shops of the New Orleans & Mississippi Valley Railroad to be located at Vicksburg.

Gen. T. W. Hyde has decided to build an extension to the Bath Iron Works, of Bath, Me., the addition to be utilized for foundry purposes.

It is proposed to form a stock company at Hannibal, Mo., for the purpose of starting a wagon manufactory. Mayor Rederick, of that place, is interested.

Efforts are being made to organize a stock company at Uniontown, Ky., to establish a foundry and machine shop, and to manufacture agricultural implements.

F. B. Bannan, Pottsville, Pa., has issued a catalogue of radiators for steam heating, fully illustrated. He gives a list of some of the buildings where they are in use.

The W. O. Hickok Manufacturing Company, Harrisburg, Pa., formerly W. O. Hickok, has been incorporated. Capital stock, $250,000. Treasurer, Martin L. Metzger.

A company has been formed at Nashville, Tenn., to erect two blast furnaces in Sequatchie Valley, to cost $200,000. Dr. William Morrow and ex-Governor Marks are interested parties.

The Vicksburg, Shreveport & Pacific Railroad have commenced work on the addition to their shops at Monroe, La., to be enlarged. The main shop will be 60×150 feet.

John S. Perry, of Albany, N. Y., has been investigating the advantages of Birmingham, Ala., and Chattanooga, Tenn., for a stove foundry, but has reached no decision yet.

A Cleveland sewing machine company contemplates the erection of large works for the manufacture of a new type of sewing machine, the invention of a Springfield (O.) man.—*Iron Trade Review.*

The New York Supply Co., 50 John street, New York, have issued a large illustrated poster on cardboard, showing cuts of quite a number of the most used machinists' and engineers' tools and supplies.

The Warner & Hough Machine Co., St. Paul, Minn., have accepted the agency in the Northwest for E. Gould & Eberhardt's machine tools, Davidson steam pumps, and the St. John cylinder packing.

The new shops which the Buckeye Bridge and Boiler Works, Cleveland, are erecting to take the place of those recently destroyed by fire, will be supplied with new tools and all the latest appliances for getting out and shipping work.

The Co-operative Nail Mill, at Belleville, Ill., is all under roof, and there are twenty-two machines on the ground. For some reason, however, the engine has not yet been delivered, in consequence of which the starting of the works has been delayed for quite a while.

Randolph Brandt, of 38 Cortlandt street, New York, reports the sales of his Selden packing larger at the present time and during the past year than ever before. He has just appointed Parke & Lacy, of San Francisco, Cal., and Portland, Oregon, agents for the Pacific Coast.

R. G. Atkinson & Co., Pine Bluff, Ark., have, it is reported, contracted to erect the machine shop, roundhouse, &c., previously reported as to be established there by the St. Louis, Arkansas & Texas Railway, at a cost of about $100,000.—*Baltimore Manufacturers' Record.*

Work on the foundation of the new Maine Central shops at Waterville, Me., is pushing forward rapidly. The foundation for the blacksmith, tin and copper shop is completed, and the masons are now at work on the machine shop proper. By the first of August the foundation of this shop will be finished.

The town of Milford, Mass., at a special town meeting, voted to exempt from taxation for ten years a building four stories high, 42x90 feet, with two additions 20x40 feet, each one story high, to be erected by John McLane for a hosiery mill, and also the stock and machinery of P. Bartlett & Son, hosiery manufacturers.

The Automatic Drill Press Company, of Chicago, has been incorporated. Capital stock, $50,000. Wendelin Seng, Wm. Kreicker, and A. P. W. Skinner, 166 Washington street, corporators.

The Diebel Mfg. Co., Philadelphia, have reorganized their business, and have increased their line of emery-wheel grinders and grinding machinery. S. A. Smith, 39 South Canal street, Chicago, Ill., is Western agent for the sale of these machines.

C. L. Jackson &Co., are successors to the firm of Jackson & Tyler, dealers in machinery and machinists' supplies, of Baltimore, Mr. Tyler having retired. They carry a large stock of tools and supplies at their warehouse, 54 German St. They will issue monthly lists of second-hand machinery placed in their hands for sale.

The Marinette Iron Works Company, Marinette, Wis., are building an addition of 70×120 feet to their machine shop, which they expect to have finished in about two weeks. They have also just completed a thoroughly fire-proof pattern warehouse of brick and stone with iron roof 120×30, and are employing 175 men, and working day and night. —*Industrial World.*

The Wassell Steel Company, office 605 Hamilton Building, Pittsburgh, Pa., have perfected their process of rolling plate and sheet steel from old steel rails, and at present are forming a company to erect a mill to operate the process. Part of the stock has already been taken, and several business men of Pittsburgh and Alleghany are considering the investment.—*American Manufacturer.*

The Wainwright Mfg. Co., Boston, Mass., manufacturers of feed-water heaters, etc., are enlarging their plant by erecting an addition to their factory of four stories 31x78 feet., which will contain machine shop and corrugating and radiator departments. The former building has been moved, and will also be utilized as a machine shop. The change is expected to treble their output.

The D. E. Whiton Machine Co., New London Conn., incorporated June, 1886, has purchased from D. E. Whiton the business of manufacturing the Whiton chucks, centering machines and gear cutting machines, together with the recently erected factory and equipment at that place, and will continue the manufacture of these tools. D. E. Whiton is president, and L. E. Whiton, secretary and treasurer.

Franklin, N. H., held a special town meeting the other day for the purpose of exempting from taxation the addition to be built to Sulloway's mill and the building to be erected by the Franklin Needle Company. The town voted to exempt the needle company on condition they invest $10,000, but the application of Sulloway was defeated. Perhaps Sulloway will build his addition in some other town.

The Muncy Traction Engine Co., Muncy, Pa., is a new corporation which bought an old machine shop plant, and is now erecting boiler shops. It will employ about 100 men. The concern's specialty will be traction engines (Larzelere's patents). They are also building heavy engines and boilers, also boiler rolls, punches and shears. Capital stock of $30,000 is to be increased to $50,000 next spring.

A cordage company has been organized in Chelsea, Mass., with a capital of $250,000, $200,000 of which has been subscribed. Twenty-five acres of land on Eastern avenue have been purchased, and a rope-walk about 1,900 feet in length will be built. The company's officers are: President, Isaac Stebbins; treasurer, S. B. Hinckley; clerk, G. W. Moses; trustees, Isaac Stebbins, Charles K. Pearman, and S. B. Hinckley.

The citizens of East St. Louis, Ill., are very much pleased over the intention of the Standard Foundry Company to locate in their midst. The establishment of the Western Forge and Rolling Mills in that town within the last year, the expenditure of probably $100,000 in improvements by the Tudor Iron Works, and lastly the removal of the Standard Company to the east side, are giving to East St. Louis a prominence in iron manufactures which she appreciates.—*Age of Steel.*

The New York branch of the National Water Tube Boiler Company, 36 Cortlandt street, have some accounts of tests of the Moore water tube boiler, made by the engineers of the Oneida Community. The record of these tests is considered valuable, because made without the knowledge of anyone interested in the manufacture or sale of the boiler. One of these tests shows an evaporation from and at 212° of 11.37 pounds of water per pound of coal, or 12.88 pounds per pound of combustible results not often equaled.

Hartford, Conn., has a new style of electric lighting, and is very much delighted over its success. Some of the principal manufacturers of that city are interested in the company, the Waterhouse Electric and Manufacturing Co. The directors are Asa S. Cook, S. W. Bishop, Francis A. Pratt, Chas. E. Billings, A. G. Waterhouse, S. O. Prentice, G. M. Bond. The *Hartford Courant* says the company has a solid backing, both financially and mechanically, five of the directors being mechanical experts. As to the light itself, the *Courant* declares it to be brilliant, steady and superior for both indoor and outdoor lighting. Two generators are working 45 arc lights in the streets of that city. It takes less than half a horse-power per light, while most systems require a horse-power or more for every arc light. Good, steady electric lighting, with the cost reduced is what the public are seeking for.

Machinists' Supplies and Iron.

NEW YORK, July 29, 1886.

The demand remains moderate, and the market has continued quiet and steady. An increase in cost of manufacture, owing to the new schedule will probably slightly advance manufactured iron.

American Pig—The abundance of all grades except No. 1 Foundry, rendered visible an anxiety to sell. We quote Standard Lehigh and North River brands $18 to $18.50 for No. 1 X Foundry; $17 to $17.50 forNo. 2, and $16 to $16.50 for Grey Forge. Other brands are obtainable at the usual concession of 50 cents to $1 per ton.

✲WANTED✲

"Situation and Help" Advertisements only inserted under this head. Rate, 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—A first-class pattern-maker on engine work; none other need apply. Address McEwen Bros., Wellsville, N. Y.

Wanted—A position by an experienced foreman pattern-maker; references given. Address Experience, AM. MACHINIST.

Wanted—A man that is a good machinist, and understands building wire nail machines. Address Wire Nail, AM. MACHINIST.

An experienced draftsman on steam engines and general machinery would like to change position. Y. X., AM. MACHINIST.

Wanted—By a thoroughly competent man, situation as foreman in pattern shop; large experience as foreman. G. S., AM. MACHINIST.

A thorough machinist and draftsman desires to take position in machine works where a right-hand man is required. B., AM. MACHINIST.

Wanted—By practical mechanic, position as foreman; 15 years experience as manager; strictly temperate and industrious. Address O. M., AM. MACH.

Traveling salesmen handling engineers' and mill supplies, can make desirable arrangements to sell "Eureka" packing. Special pocket-book of samples furnished. Hine & Robertson, 12 Cortlandt st., N.Y.

Draftsman and inventor of responsible capability is open for engagement; thorough experience on steam engines; successful as inventor. A. F. Fogelquist, 367 Broad street, Newark, N. J.

Wanted—Traveling salesmen selling to steam users, machinery and mill supply houses and the hardware trade, to write for my terms and commission on some fast-selling articles. Address J. L. K., AM. MACHINIST.

Wanted—A first-class machinist to take an interest in an established iron works in a Western city; no capital required; must be acquainted with engine and boiler work, and capable of taking charge of mechanical part of business. Address "Western," AM. MACHINIST.

Wanted—Manufacturing Company (near Chicago), wants an energetic, competent Eastern gentleman to take charge of office business and finances; one of some experience in manufacturing establishment in the East preferred; position permanent; fair salary first year; business pleasant and profitable, in an enterprising town; a bright, capable man will be offered excellent opportunity to engage in business; satisfactory party may secure an interest. Address, with references, Brass & Nickel, AM. MACHINIST.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Gerlach's Engineers' Specialties beat the world. Send for price-list. Crescent Mfg. Co., Cleveland, O.

Crescent grease cup for shafting beats them all Sample free. Crescent Mfg. Co., Cleveland, Ohio.

Steel stamps, stencils, burning brands, and brass checks. T. M. Parker, Hartford, Conn.

Light mach'y of all kinds built at short notice. Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

For Sale—A 7′ swing face-plate lathe; low price. J. A. Stowell, Leominster, Mass.

For Sale—A Berryman heater, 18′ x5′, 6″ high; but little used; in perfect order. Edward J. Moore, 49 N. 7th street, Philadelphia, Pa.

Wanted—Catalogues of engines for running elevator and light machinery; suitable for pork-packing house. M. J., 43 William st., Bridgeport, Conn.

Send for estimates of high-speed compound enginss for stationary and marine service. Crist Engine Works, 140 Baxter street, N. Y.

John Lamberty, mfr. telegraph and electrical instruments, experimental machs, models; fine gear cutting a specialty. 35 S. 5th st., Br'kl'n, E.D., N.Y.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

Wanted—A practical machinist, with some capital, to take partnership and entire charge of a machine shop equipped with new tools; a foundry doing a large business will be run in conjunction with same. Murray & Stevenson, Anniston, Ala.

J. WENDELL COLE, M. E.
Manager of Pennsylvania Southern Lake regions and the Northwest for
DETROIT EMERY WHEEL CO.
Address, Box 84, Columbus, O., or P. O. Box 152 Chicago.
Hart's Corundum-Emery Wheels.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

To Rent—Desirable space, 8x10, in light, well-fitted office; heart of machinery trade; $12 per month. Hine & Robertson, 12 Cortlandt st., N. Y.

For Sale—A well established foundry and machine shop, including lots, buildings, machinery, patterns, and stock on hand, situated in Logan, Hocking Co., Ohio; will sell on easy and satisfactory terms; reason for selling—old age and ill health. Apply to R. Belt, Logan, Ohio.

Wanted—Two engine lathes to turn 30″ over carriage, and 10′ between centers, one slotting machine, with 14″, 16″ or 18″ stroke. All must be in first-class condition; please state name of makers. Address P. O. Box 476, Philadelphia, Pa.

M. Martin, manufacturer, P. O. Box 285, New Brunswick, N. J., will contract for the manufacture of articles in brass and other metals (stamped or turned), and dies and tools for making same; also patent novelties, electrical inventions, special machinery castings, etc.; estimates cheerfully given.

Alfred Dolge (Felt. Dept.), Dolgeville, N. Y. writes to T. R. Almond, 83 and 85 Washington st., Brookiyn, N. Y. "Your Almond Couplings are doing splendid work. I have used two for months, to the satisfaction of every one in my mills. Am putting, up the third one now, and certainly give them the preference over beveled gears."

BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER

Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other **Hammer** in the **World.**

BRADLEY & CO. Syracuse, N.Y.

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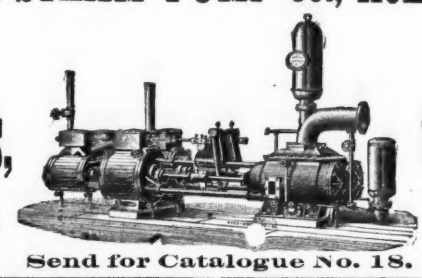

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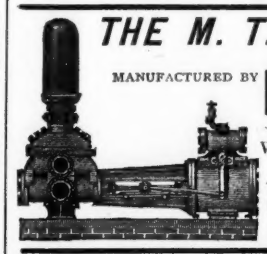

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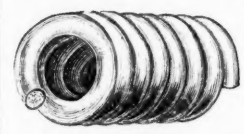

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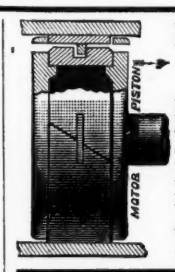

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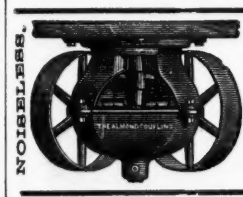

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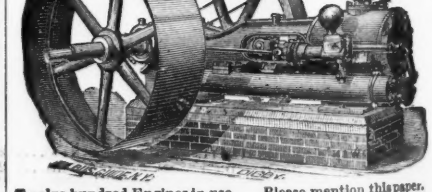

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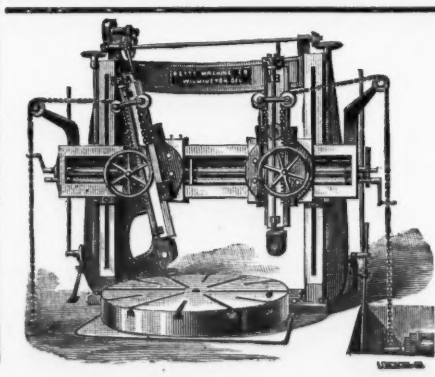

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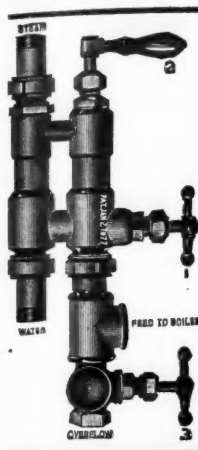

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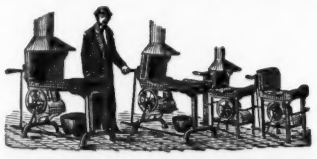

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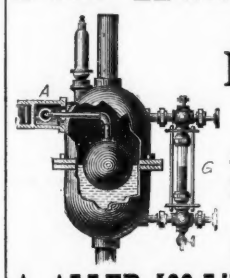

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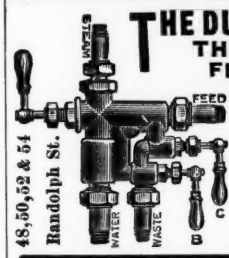

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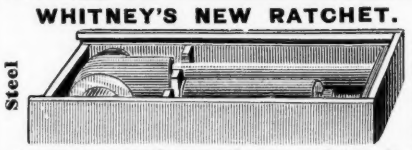

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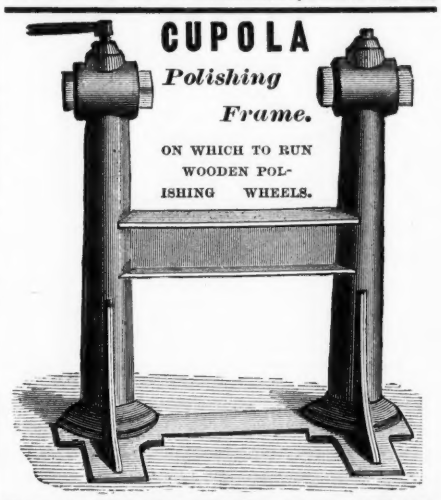

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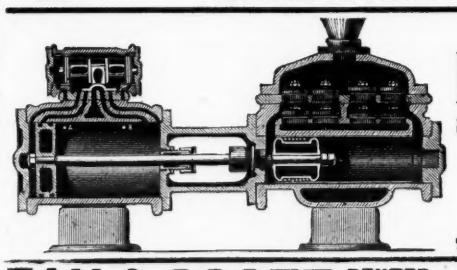

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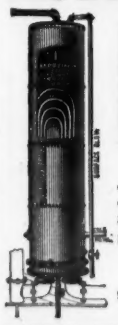

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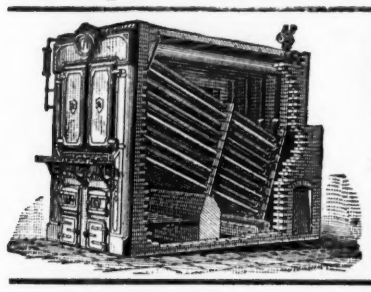

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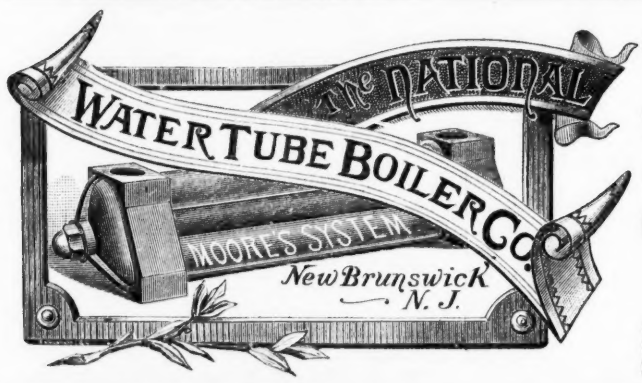

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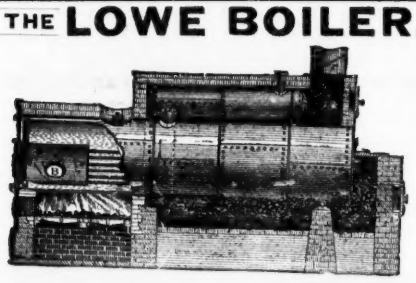

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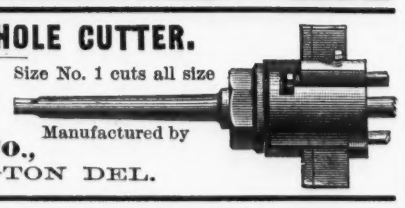

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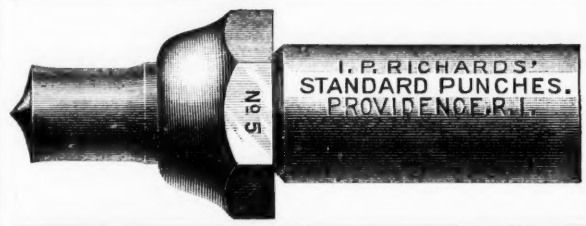

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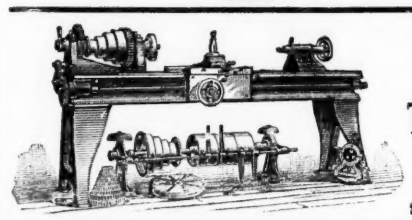

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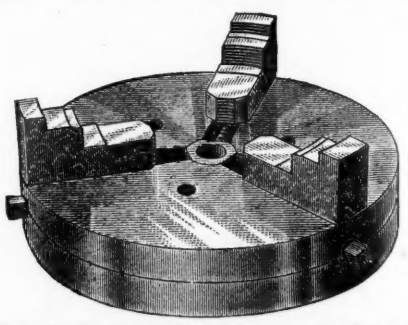

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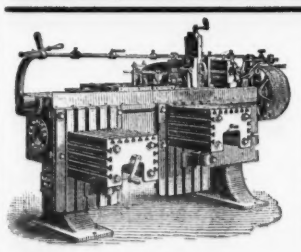

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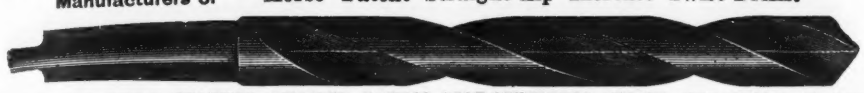

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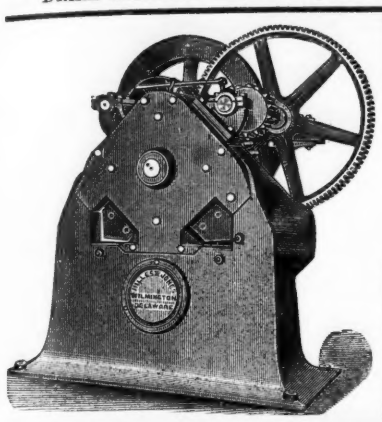

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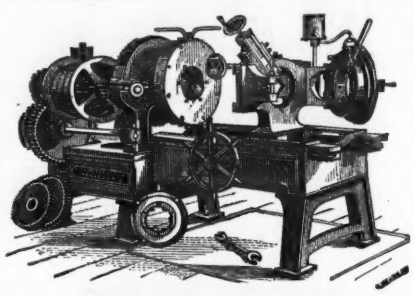

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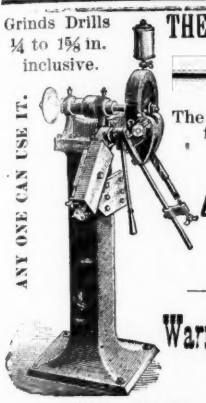

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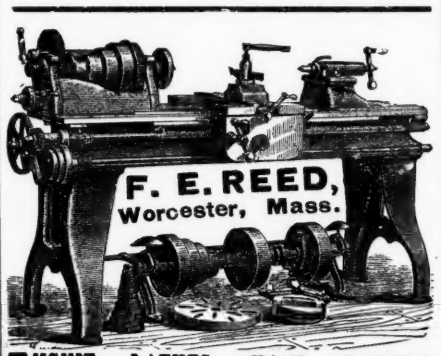

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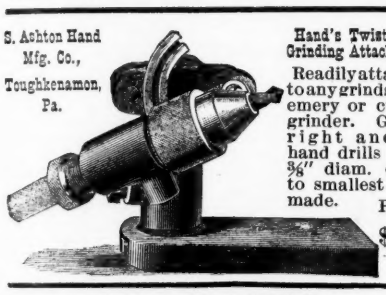

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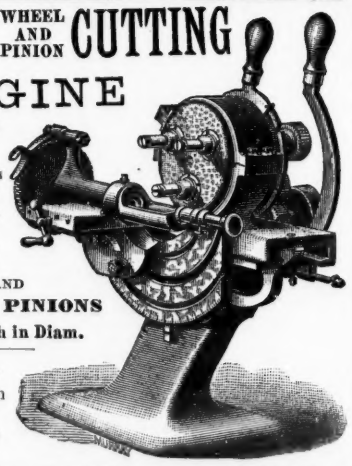

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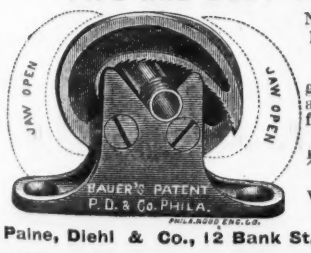

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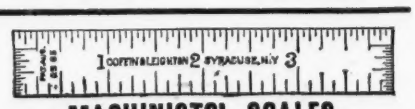

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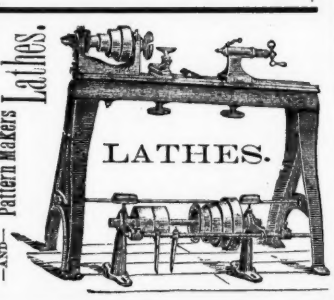

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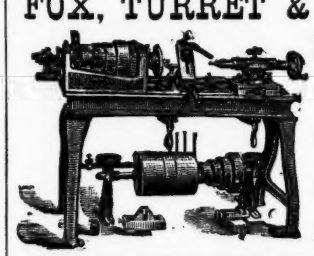

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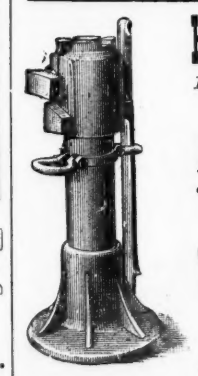

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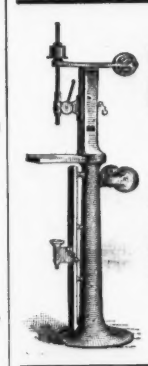

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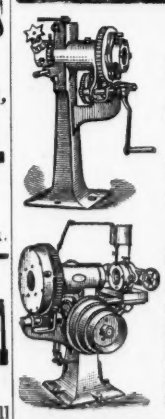

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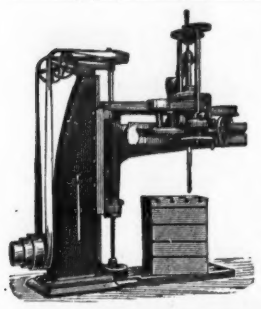

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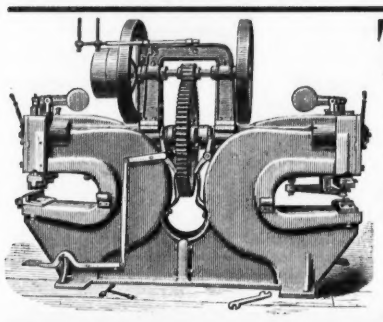

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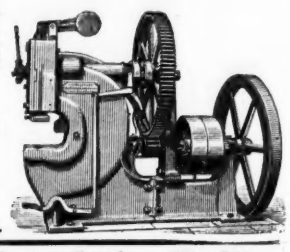

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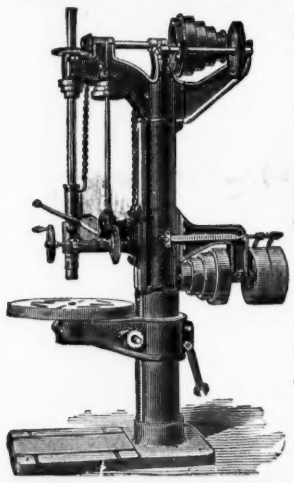

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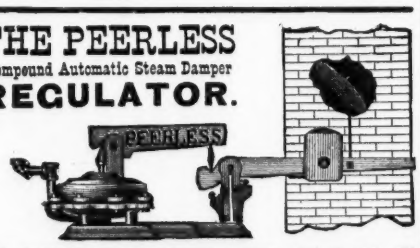

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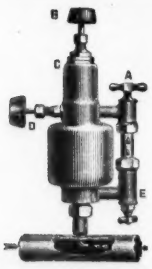

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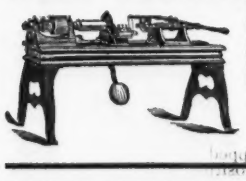

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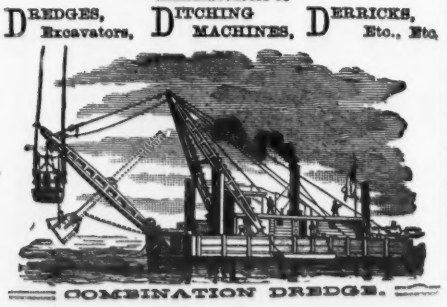

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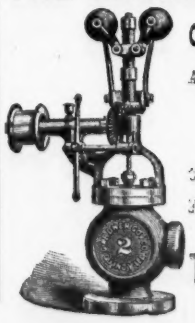

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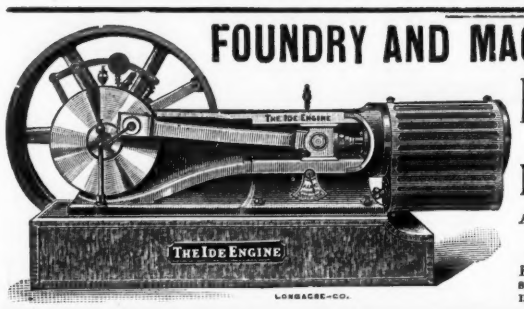

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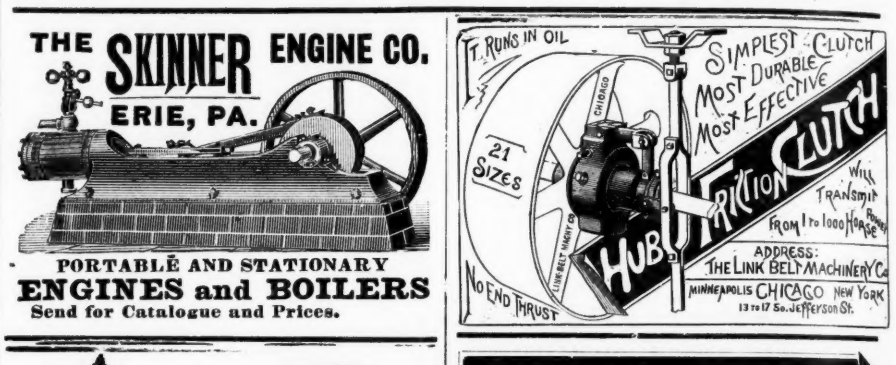

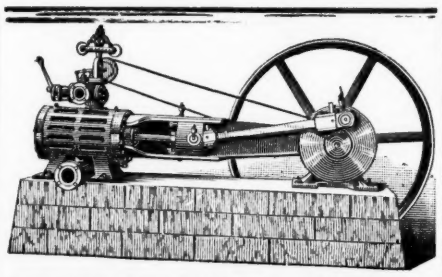

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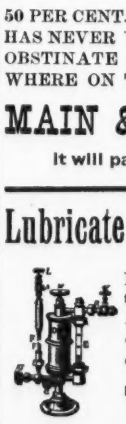

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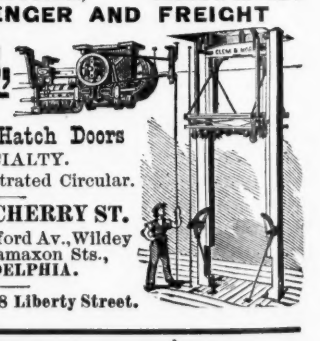

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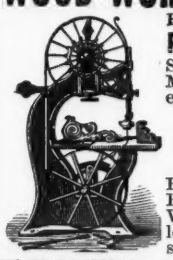

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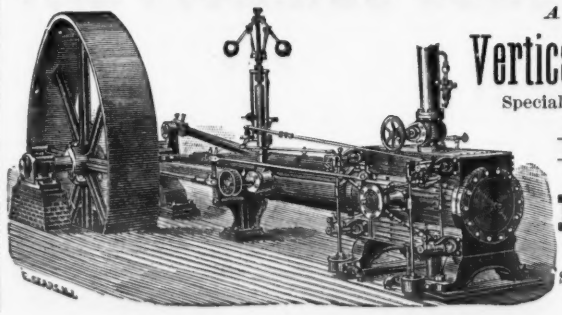

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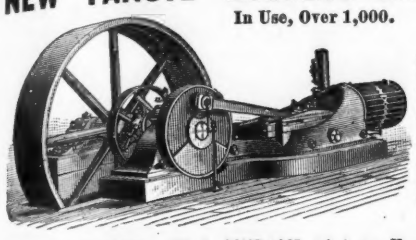

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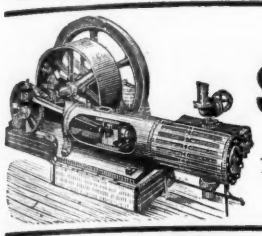

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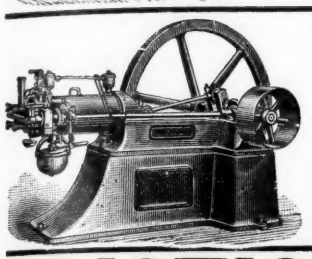

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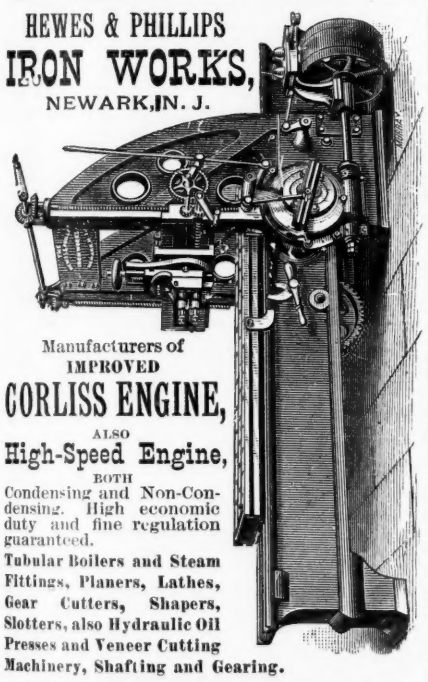

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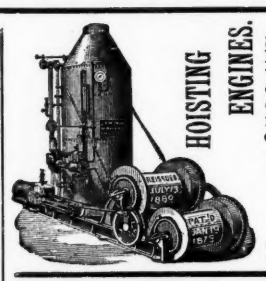

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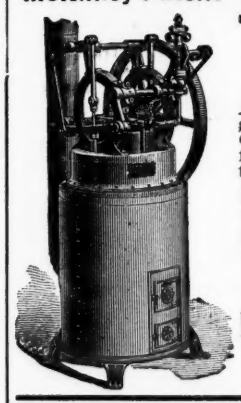

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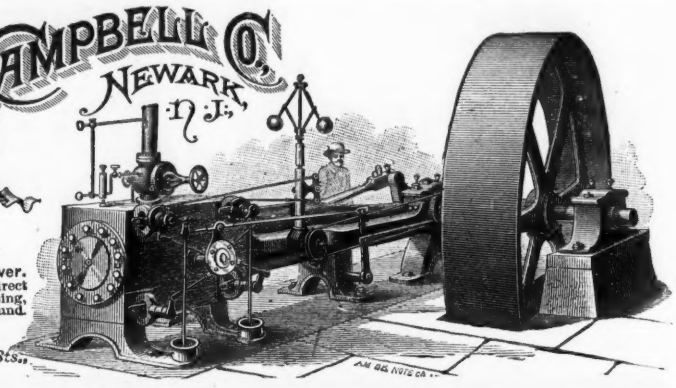

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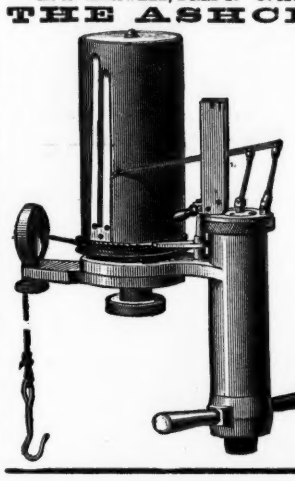

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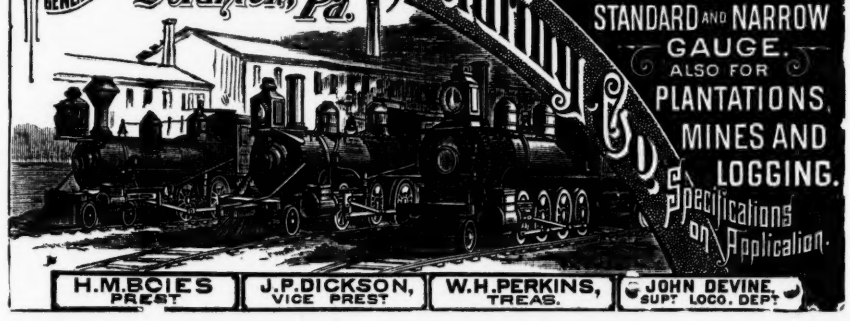

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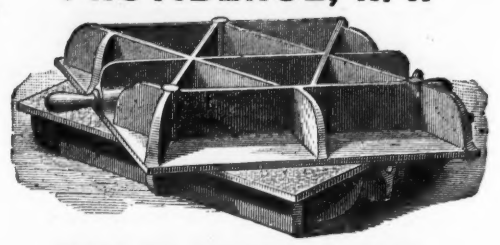

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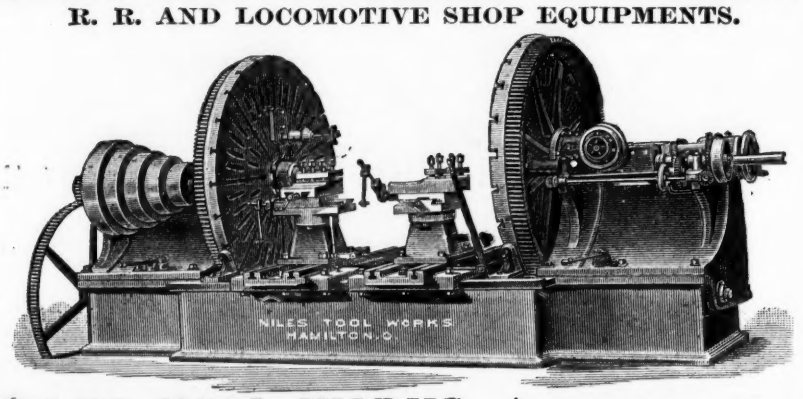

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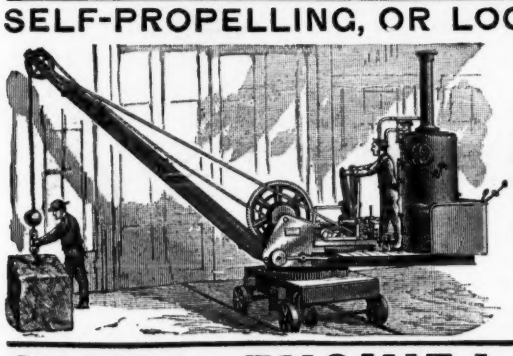

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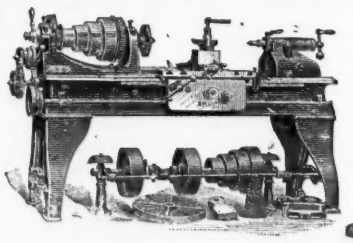

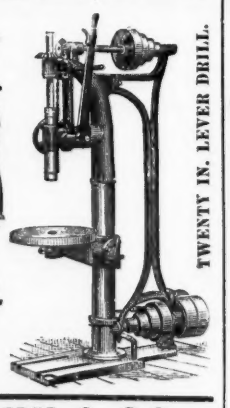

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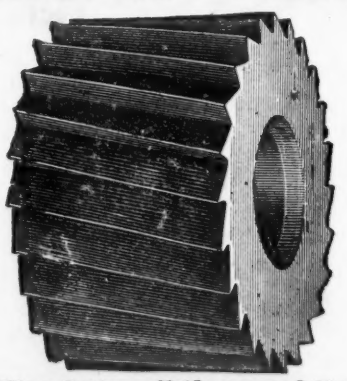

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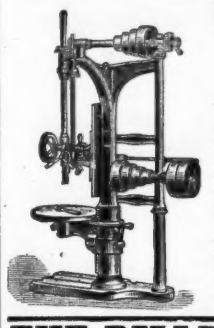

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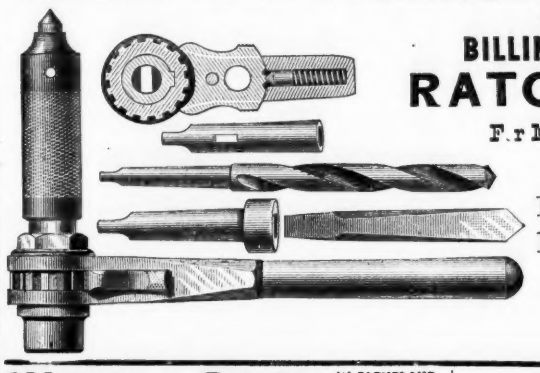

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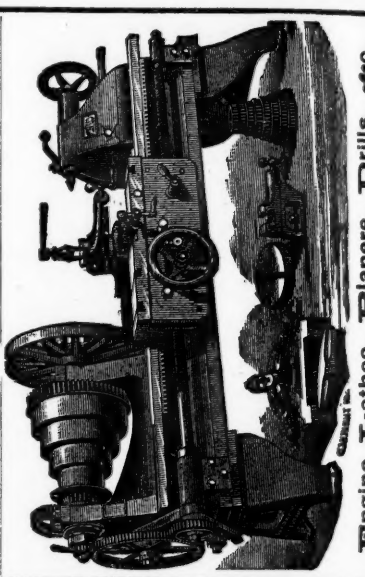

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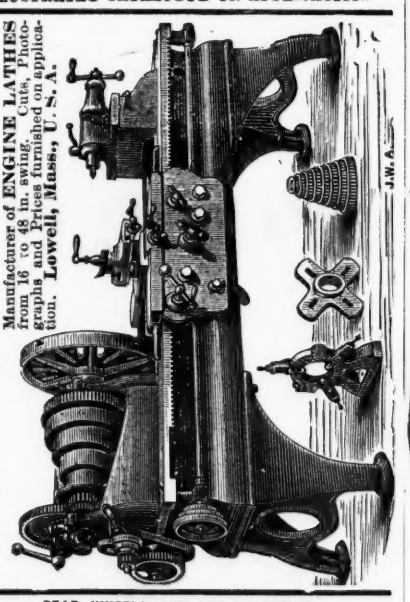

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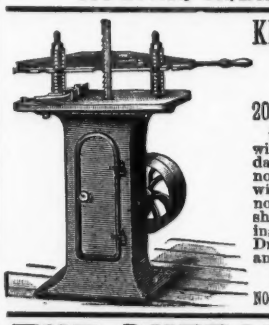

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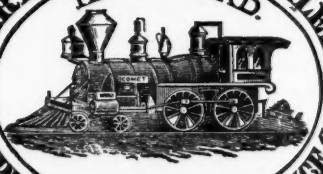

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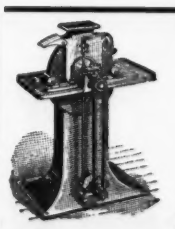

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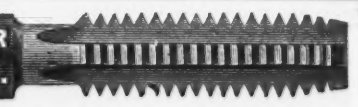

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